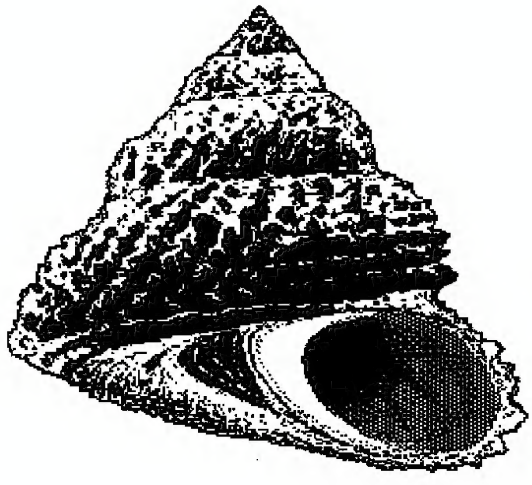
COOKIA



JOURNAL OF THE WELLINGTON SHELL CLUB

NEW ZEALAND

VOLUME 16

NOVEMBER 2004

CONTENTS: *COOKIA* Volume 16, 2004

Chathams Diary – 8th to 17th December 2003	Pat Lakeman
Comment on the Chatham Islands species list and on new shell records	Jenny Raven
Distribution of marine molluscs along the Temperate and Cold Water regions of the Southern Ocean and adjoining zones	Zvi Orlin
Collecting rock borers in New Zealand	A.G. Stevenson
'Let him name it who can …'	Jill Burnet
Marine Mollusca – Ngamotu Beach, New Plymouth	Jim Harding
The charm of South African shells – a short excursion in the Southern Cape	Zvi Orlin
'Location – Location – Location'	Jill Burnet
The "Yuk" method of cleaning shells	Eddie Torr
The Operculum	Anne Gray Hackney
Whangamata and other Coromandel beaches	Jim Harding
Paryphanta – New Zealand's largest land snail	Mary Mouat
Marine shells found at Whangarei Heads	Charles Cooper
'Measure for Measure': or, what Shakespeare never knew …	Elliot Dawson
The latter day Argonauts	Jill Burnet
'Open Nomenclature' – the pitfalls of "?", "*cf.*", "*aff.*"	Elliot Dawson
Maoricolpus roseus – a washup and a commentary	Mary Agnes Wotton & Elliot Dawson
Is a "rare shell" really "rare"? Some thoughts on deep-sea collecting	Elliot Dawson
BOOKS:	
CIESM Atlas of Exotic Species in the Mediterranean, by A. Zenetos *et al.*, 2003	Zvi Orlin
Seashore Ecology of New Zealand and the Pacific, by John Morton, 2004	Elliot Dawson
The Shelled Magellanic Mollusca: with special reference to biogeographic relations in the Southern Ocean, by Katrin Linse, 2002	Zvi Orlin

ISSN 1171-140X

© Wellington Shell Club 2004

CHATHAMS DIARY - 8th to 17th DECEMBER 2003

By Pat Lakeman

Tuesday 9 December: Wow! - it is end of day two already, and we have lots to catch up on. Jenny, Carolyn and Pat met at Wellington airport on Monday 8 December – loaded to the gunwhales – Jenny 1 kg under but Pat and Carolyn both having to pay about 5kg excess baggage – not the end of the world (about $13) and we had our priorities right – food! Food is expensive (as are most other things) once you get to the Chathams and having paid about $620 each return airfares and due another $400+ each for accommodation, we didn't want to pay the earth to eat.

On the plane we all sat next to different men (!) and of course got to know a bit about them. Pat sat next to Peter from DOC,[1] a regular who had visited two or three times per year in past few years for oystercatcher surveys (endangered, a population of about 250 and increasing under management). On one occasion Peter and his wife Stacey had stayed for Christmas, and because Stacey had experience with horses she was roped in as a jockey at the annual race meeting traditionally (since about 1888?) held over two or three days between Christmas and New Year. A bit sad to hear that this year for the first time there are no races, due to there being insufficient trainers to get horses ready.

Jenny sat next to a fisherman, most friendly, though he did not collect shells – preferring bluenose and groper - loved the outdoors, hailing from Napier, but couldn't wait to get back to his boat, which he pointed to out the window as we winged in, low over the lagoons. He read Don's report of diving on an earlier trip, and was mildly interested in what we would be up to.

Carolyn sat next to another DOC man returning after a break to the Chathams for a 3-year contract to work on marine mammals and strandings, and pest control. He knew quite a bit about Chathams history. In the process of arriving we met Rhonda who now lives off-island and was returning for a visit. She owned the motels we were to stay at, and had owned Roos Roost where Pat and Jenny had stayed on their last trip.

We went for a walk soon after arriving at our motel (a bit further away from the beach than Roos Roost had been) – down to the shore and thought – 'to the bridge (turn right/east) or the wharf (turn left/west)?' To the bridge – the tide was fairly high but we got down on the inner side of the stream and we met a shell-collecting lady, her partner and their two dogs. She sets shells into resin, on sand base, producing paperweights that display the shells. She was most friendly, works at the store, and gave us some location tips.

On our stroll Jenny found the most magnificently huge *Haliotis virginea morioria* -- intact – she thought it was a small *H. iris* – it was half buried – but it is enormous (74mm x 52mm). Pat finds shell collecting very character forming sometimes – Jenny did find it a bit hard to show it to such an avid *Haliotis* collector! Only a slight wash up – the sea being fairly calm – but we found a nice *Calliostoma granti*, some *Modelia granosa*, a yellow *Talochlamys zelandiae, Cantharidus opalus* and a *Gari convexa*.

[1] For the benefit of overseas readers, DOC is the acronym for the New Zealand Department of Conservation.

That evening at our motel we met two guys, Bob from NIWA[2] doing climatology work, and Mark the vet, who were staying for just one more night. Bob had the 4-wheel drive that we were to hire from Wednesday, and showed Jenny how to drive it - even suggested she take it for a drive (saying she could drive him to the airport in the morning and then keep it) but she wisely desisted. Mark came in late and a bit tired – having been here a week - but we chatted for a while and learned that spaying cats and dogs pays for his trip and other vet things get done as they arise. Bob told us about a Hungarian couple who were about to be deported, and when we asked about fresh vegetables told us about a local who grows good vegies but could well be a bit drunk in the afternoons. The things you learn!

Tuesday morning, Mark and Bob were away early, but we had no need to hurry because low tide was not until about midday. Pat went down to post letters at the store but found the PO is in the bank, which did not open for another half-hour. Island time prevails. We walked out past the Waitangi wharf, which seemed a bit more commercial, with a few more buildings than we remembered. Then we climbed down some rocks and it was sunny - fresh green seaweed, little bays with nice shell sand and a few washups. Silver pauas, slit limpets, shell sand containing *Margarella fulminata* – Jenny showed Pat what to look for, and scooped some into a bag for later revelation. Carolyn took photos, especially of the nice reddish cliffs - there were nice *Cellana strigilis chathamensis*, and a few *Cantharidus opalus*. *Cominella maculosa* in rock pools were monsters.

On the way back Jenny and Pat changed into wetsuits and tried to explore Petre Bay in front of the hotel to look for the wide banded *Buccinulum linea*, It was quite murky and we could see very little. We wandered over to the bridge, and getting cold, we gradually followed Carolyn back to the motel for a hot shower. In the late afternoon Jenny took two hand lines down to fish off the wharf, while Carolyn walked along to the bridge finding things that, if they had been whole, would have been treasures – but that is so often the way it is! We had set our rendezvous as the pub at 5.30pm, and over a jug of 'Island draught' we learned that Jenny had caught two fish – our dinner! Jenny scaled them on the beach, and we returned for a good dinner and a look at our shells so far.

Thursday 11 December: Yesterday Jenny picked up the car and we started off, late in the morning, in our flash 4-wheel drive, heading for Owenga. En route to pick up the car, Jenny had looked again for a *Turbo smaragdus* that she thought she had found (and thrown away) the previous day. Realising it wasn't listed as found on the Chathams before, she went back to get it, and it was still there (and beside it was a very large and nice *Tanea zelandica* – which hadn't been there the day before!).

At Owenga we parked in a nice little spot near the church where we thought we could remember the quick way down to the beach – which we did, with a bit of a struggle in the long grass – and saw a nice clump of red gladioli growing wild on the way. On the beach south of Owenga the wash ups weren't extensive, but there was plenty to look at and, on one point, a lot of shell material including good shell sand. Pat stayed put here for an hour - once shown *Paxula* she determined to find more, and did, along with *Rissellopsis varia* and *Thoristella chathamensis* (Jenny also found large examples of these). There were also *Trochus tiaratus*, some nice *Cantharidus opalus*, and very large *Melagraphia aethiops*. Jenny also found *Felaniella, Monfortula, Buccinulum vittatum*, and large *Xymene traversi*.

[2] Similarly, NIWA refers to the National Institute of Water and Atmospheric Research Ltd, one of the New Zealand Crown Research Institutws formed after the demise of the Department of Scientific and Industrial Research [DSIR].

In lovely sunshine, Carolyn walked way round the coast, almost to opposite the statue of Tommy Solomon. Jenny went almost as far, but diverted out to a far point of the reef, paua-hunting. Right at the end there were large pools that were about knee-deep, filled with lots of weed, and on parting the weed the pauas were sitting there waiting to be plucked off the rock. So Jenny took seven for our dinner, and trudged back, to find Pat hadn't moved much from the shell sand. On the way back Pat thought she saw *Cellana denticulata* but they aren't found on the Chathams so they must be *C. strigilis chathamensis* – but Pat took photos anyway. Back to our vehicle (taking a few gladioli bulbs on the way) – we had a look inside the pretty church before descending the other side of the hill and walked out on the wharf - which is getting pretty rickety! We chatted to a fisherman who had caught one cod but said the fish weren't biting much, and when we said we were shell collectors, he said "Yes, my wife does that".

Back in our car we went to find the Solomon statue at the far end of the road, where he looked a bit forlorn but friendly. Photos were, of course, taken. Then back past the beaches north of Owenga that we had yet to explore – where we felt sure there must be shells – then back home just before the shop closed at 6pm to buy a few fresh goodies - and a very nice bottle of red at a very modest price.

Thursday dawned very early for Pat, who woke and didn't need to go back to sleep again, so she took her camera, hoping for some good skies at sunrise. But no go, it clouded over - a nice walk along the beach at high tide anyway. After breakfast we were all away by about 10.30am, off to Taupeka Point. We talked to the friendly farmer who let us through his property to the Point and in two ticks we were on the beach. And, boy, were there shells! They were on the beach and thick upon the rocky points.

Haliotis virginea morioria were in abundance both on the beach and round the rocks. There were lovely fan shells, large slit limpets, and lovely *Trochus viridis* that, in fact, were red. The washup seemed to get better the further round the point we went, and although the wash up was sun bleached it was not that old. *Tucetona laticostata* were evident, and *Calliostoma granti*, a few of which were very large – Jenny found two beauties. At the far end of the Point, amongst endless chopped up shells, Jenny flopped down and spied one with a hole in it – and the hole was meant to be there! It was *Monodilepis skinneri* and this backed up Don Watson's finding of the shell here some years back. Also found were *Argobuccinum, Austrofusus glans* (both forms), large *Cantharidus opalus, Modelia granosus*, large and plentiful *Lepsithais lacunosus, Cabestana spengleri*, and Pat found a broken piece of *Provocator mirabilis*. We also saw a few worn *Cominella nassoides iredalei*, broken *Alcithoe wilsoni*, a few large banded *Buccinulum vittatum*. There were some nice fresh *Soletellina nitida* doubles on the beach. All this takes us hours to enjoy and search through - it is a beautiful day and a pristine, gentle place that we have entirely to ourselves. We don't want to leave – but eventually we do, and tonight we are tired – and Jenny is frizzled by the sun from looking into pools – so a quick look at our haul of shells after dinner and we are ready for sleep.

Saturday 13 December: Yesterday was fine again and we homed in on Port Hutt and the stone cottage. We looked at the arid and barren countryside on the way, with just a few green patches, turned off on the route to Maunganui at Waitangi West where the stone cottage is, travelling through an almost lunar landscape until only bulls and electric fences stood between us and the stone cottage which is about 40 minutes walk away from the road. Gingerly, Jenny and Carolyn followed Pat through the bulls' paddock - and all the animals went the other way! On and on we went and eventually we reached the stone cottage – which had a new roof sparkling in the sunshine since the last visit by Jenny and Pat. Jenny signed the visitors' book for the third time!

Pat for the second, Carolyn for the first. Photos! (of course) – and we admired the huge rock outcrops behind the cottage before heading over the dunes to the beach which Carolyn climbed down onto while we had our lunch.

Back past the bulls and horses without incident, and on our way again back to Port Hutt for the low tide. Once there almost the first thing that happened was Jenny finding – amongst a large amount of flotsam and jetsam on the shore – a discarded black seedling tray. This (believe it or not) was just what she wanted and had looked for in the garden/hardware store – for sorting her shell sand.

The smell behind the fish factory was too much for Pat, who took off around the rocks and out to the fresh air at the harbour entrance. Carolyn walked to the other end of the bay. Jenny moved slowly along the shoreline to the boat wreck which is still prominent in the inner bay. She became 'grounded' when she found what she was looking for - *Buccinulum linea* - around the wreck in particular. Carolyn found Jenny and then went off to find Pat, and a canine companion dogged our footsteps and kept us all company at various times. Pat had by this time collected paua for our dinner, and on her way back, looking under stones in just a few sandy patches, found *Buccinulum lineum, B. vittatum* in the nice brown colours, and just a few pristine *Montfortula chathamensis.* Meanwhile Jenny back at the wreck was finding many *B. lineum* as the tide continued to go down. These are the '*waitangiensis*' form (with very broad dark bands – wide-lined), and were more common than in front of the hotel at Waitangi, which we had previously thought was the best spot. Carolyn had been finding really huge *Cominella maculosa*, and *C. adspersa*, and nice *Trochus viridis* and *Cellana strigilis chathamensis* for which it is a good area. After a while Jenny and the dog wondered where Pat and Carolyn had got to, so she started to follow them out along the coast. From behind the fish factory she spied two blobs in the far distance, and sent the dog off to fetch them.

On the way back we stopped at Whangamoe Inlet (just in behind Napper Point) - which had been famous for its *Cantharidus opalus* on a previous visit by John Marston and Don Watson. Broken pieces were much in evidence, but we found only one whole specimen. We then hit the road for Ohirato, which none of us had been to before, and we walked about 20 minutes to the beach where the foreshore consists of basalt pillow lava – which is divided into pentagons and hexagons and is beautifully stepped for walking on – and very photogenic! After that stop it was getting late – about 7pm – so it was off home to a delicious feed of paua.

Slow start the next day - if Carolyn hadn't got up to do some washing, Jenny and Pat might have stayed in bed all day. We refuelled our car, and our food supplies with a few essentials, and then set off down the south coast, as far as we could go. We opened a closed gate (with no hinges) to get through and carried on regardless, but we were disappointed to find that the road petered out at a point where it was no longer maintained by the Council, and a sign said we could only proceed at our own risk – at the start of a precipitous upward slope which we decided not to attempt! On the way back we stopped at a bridge over a ford where the road was closest to the sea. Nearby as the crow flies, was Point Durham lighthouse, a small automatic installation that Carolyn wanted a closer look at. Pat accompanied her, and they found that a maze of electric fences made the distance considerably longer than for a crow. Jenny had decided to investigate the numerous rock pools below on the coast. As there were no shells but many deep pools, she found a paua which was soon attached to her fishing line and thrown into the deep water off the rocky ledges. Bang! Big cod – a huge one – and Jenny just had to throw that line in again – and again. By the time Carolyn and Pat got back, Jenny had three codfish, all off a spot very near to Jenny Reef – most appropriate.

Back in the vehicle and back to our motel for lunch – at about 2.30pm! And then off again – to Owenga, under skies that were getting increasingly dull and grey. We stopped at our 'usual' spot - Te One Creek - where Pat and Carolyn headed south and Jenny headed north. But before we left at 8.30pm (days are getting later!) we had all covered more or less all the coast between the paua factory to the south and the southern end of Hanson Bay. It's now 11pm as we write this, having just demolished the largest of Jenny's cod. Shells we found at Owenga included *Monodilepas skinneri.*

Sunday 14 December: We are off at 10am on a bit of a tour right to the top of the island that makes for a long day. First stop the Nikau Bush Reserve, which Jenny & Pat had visited last time. Nice to see bush on the island – it was a pleasant walk in the morning sun across paddocks to get there, and a wide vista across the lagoon on the way back. On to Matarakau, where there are two sides of the bluff to go to. The eastern side is the beginning of a big sandy beach (with Kaingaroa at the other end), and we went there first. We saw nice large lined and *bicinctum* type buccinulums, the little pink *Radiacmea* limpets in abundance, many worn *Cookia sulcata*, and many colourful but small *Modelia granosa.* Quite a colourful little washup – but while we were there the mist rolled in, visibility dropped and it got noticeably colder. We climbed up and over to the western side of the bluff, which is rocky and the shell wash ups there were old and broken. So we didn't stay long, but walked on to where the bluff joined the main sandy beach that stretches back to Taupeka, and found that via a track from the end of the beach, we were only minutes from our car. The quick way for next time!

After Matarakau we travelled on to the Hapupu Reserve which is where some of the kopi trees with dendroglyphs on them can be seen. On our way we passed some of the dead trees that stand as eerie sentinels to the more forested landscapes of the past. The reserve stands in an isolated landscape, and inside the trees it is calm and quiet, with birds flitting about and faint dendroglyphs to be seen on the tree trunks. Back in full sunshine we lingered and had our lunch. The sea is very close here, and we tried to find a way across the electric fence that acts as a boundary for the remaining strip of land with trees on. But we couldn't find a way, so we did not see what was beyond.

On to Kaingaroa, where we decided to first walk to the wharf - and spied three fishermen walking into the fish factory. We had a good chat to two of them, asked if they had or knew of any shells available, and, yea, one of them said yes. We said we be interested, and would be down on the beach ... and off we went to explore for the next couple of hours. The Point has good shell sand – Pat found *Monfortula chathamensis*, Jenny found an *Argobuccinum* in a craypot, and two *Janthina exigua* were found – one in shell sand, one miraculously whole on the bare rough rocks. Around the point is a beautiful long sandy beach – Carolyn rested on the sand, Pat walked along the beach and found a paua with a lovely pearly bump in it (straight from the paua pearl factory?!), and, as Jenny started to poke among the rock pools, our fisherman friend reappeared with two *Alcithoe wilsoni* and one *Charonia lampas.* This made our day! Finally we gathered some paua from the low tide, and set off to Waitangi to get a takeaway dinner before the café closed at 7pm. Or so we thought! In fact, on Sunday it closes at 6pm – so we spent half an hour going to the red cliffs south of Waitangi for some photography. We didn't starve - we cooked back at our motel at the end of what felt like a really full-on day.

Monday 15 December: It is fine weather yet again. Today we head for Moutapu Point just south of the airport – where there are Nukumaruian fossiliferous sands. We were unsure where these were so started from the shore, and after a long trek but in lovely surroundings - with much bird life on the lagoon - we stumbled across the old road that was the ford across the lagoon, and an old quarry, and there were the fossils. Noted amongst them were *Cominella nassoides iredalei*,

Purpurocardia purpurata, Ruditapes largillierti, and *Xymene ambiguus.* Then we set off for our favourite beach at Taupeka Point, and this time got there via the track entrance 1 km past the farm gate. It was just a few minutes to the pristine beach, where we spent a sunny afternoon idly shell collecting because there were still excellent shells to be found. Jenny was especially pleased that at the end of the beach near the point she found another *Monodilepas skinneri.* An enjoyable slow trek back and we bade Taupeka farewell (until next time!). Then we raced away to catch some paua on the south coast, AND to get to the takeaway shop before 7pm! Made it this time and enjoyed a good meal with no work involved at all. We hadn't seen or heard any news for some days, and on tv in the café saw the headline that Saddam Hussein had been captured. We followed up our meal with a drink or two at the pub, with a fine vista of the harbour through the windows.

Back at our motel we had neighbours again – three guys from Hawkes Bay here to lay carpet at the marae. Construction of the marae had begun not long after our last visit in March 1997, and it is nearly finished. Its official opening will be a local event of great importance. We sat outside chatting over coffees until well past dark, and as we finish writing this instalment of our diary at approx 11pm, a short shower of rain falls outside – the first of any kind since our arrival.

Tomorrow is our last full day, and we are going shopping! Well, a visit to the pub souvenir shop is planned, the store, the craft shop, and we need to find out about buying crayfish to take home. And somewhere we'll fit in a last look at a few shells.

Wednesday 17 December: Much of yesterday we were tourists – buying T-shirts and little souvenirs, postcards etc. At the hotel we had a look round some of the rooms that had been recently revamped – to a very attractive standard. At the store we met Cairey again – the shell collector we had met on the beach on the day we arrived. We talked shells for some time, and she promised to bring us some spare *Haliotis virginea morioria* which we could pick up on our way to the airport this morning - which indeed we did, taking her name and address so we could send her some shells in exchange when we got back to New Zealand. As a last fling at shell collecting we drove back to Owenga where Pat thought the high tide line looked promising for *Monodilepas skinneri.* Sure enough after much hunting some were found, along with a few other nice shells such *Haliotis virginea morioria* that must have escaped our gaze on our previous visit.

Shells that had looked irresistible on the beach got consigned to the motel's 'shell garden' as we undertook the serious packing needed to get all our finds carefully stowed for travel. And finds were not just shells – Pat's three animal skulls became the most interesting carry-on luggage she had travelled with for some time. Frozen crayfish and paua also accompanied our shells and ourselves on a calm and pleasant flight home. Yes – of course we want to go back again!

γ γ γ

COMMENT ON THE CHATHAM ISLANDS SPECIES LIST AND ON NEW SHELL RECORDS

By Jenny Raven

This is a list of shell species found on Chatham Island over two trips, with comments on shells found, including new records. It is an update of the list published in *Cookia* vol. 8 pp 22-23. Additional finds since then have been highlighted in bold. The list is typical of shells found intertidally, other than a few gifts from friendly fishermen.

Additional new records

Thirteen additional species were found on our December 2003 trip. Of these, *Herpetopoma alacerrima* and *Turbo smaragdus* had not been recorded on previous Wellington Shell Club trips. *Herpetopoma alacerrima* was recorded dredged from 38 fathoms [69.5m] on the 1954 Dominion Museum trip (Marston J. *Cookia* vol 7 no.3). The one found on this trip was a large (5mm) fresh specimen from shell sand south of the Waitangi wharf. *Turbo smaragdus* is recorded as a semi-fossil from Maori middens on the Chathams. The one which I found on this trip was among sea shells washed up on the inland side of the Nairn river bridge as one enters the Waitangi township. The sea washes in under the bridge at the high tide and deposits shells on the inland side to about 150 metres. This specimen was in a worn state with faded colouring and, as it was about 150 metres in, it could have washed in from either direction. It is now in the Te Papa collection.

Of significance among the additional species found was the finding of one very fresh, almost whole, *Provocator mirabilis* washed up at Taupeka Point by Pat. This backs up the find of one by Wellington Shell club member, Don Watson in 1996 (*Cookia* vol 8) [xxxxxx]. Very few of these shells have ever been found on New Zealand beaches. It was also nice to locate the Chatham Islands endemic keyhole limpet, find *Monodilepas skinneri* at two localities. It occurs probably not uncommonly in shell grit at both Taupeka and Owenga but is difficult to see because of its small size and the vast amount of similarly coloured white shells amongst which it is deposited. About twelve were found between the two localities with the area just north of the paua factory at Owenga being the best site.

Comparison with previous trips

This was my third visit and Pat Lakeman's second. In comparison with previous visits, there were no recent wash-ups this time. Each day of our stay we were greeted by fine weather, sun and sparkling seas. This made for very pleasant collecting but meant no large wash-ups of *Talochlamys zelandiae* in sponge or live *Cominella nassoides iredalei* this time. However, the quantity of shells deposited at Owenga and Taupeka Point was as extensive as ever and the calmer weather resulted in good quantities of shell sand washed in at the end of the main beach at Taupeka and south of the wharf at Waitangi. Okawa Point, where much shell sand had been collected on previous trips was not visited this time. The opportunity has been taken, however, to

add two species identified from shell sand brought back after the first trip to this latest list.

The sandy beach at Taupeka was more productive than usual yielding many shells, including *Haliotis virginea morioria*, in good condition. About one hundred *Haliotis morioria* would have been collected by the three of us on this trip although most were under 45mm in size. This made my find by of one perfect specimen measuring 74mm x 52mm on Waitangi beach on the first day quite remarkable and possibly a record for this species. Other than this, Waitangi beach received few wash-ups while we were there. Whereas most *Austrofusus* from last time were of the *chathamensis*, on this trip some very good fresh specimens of the typical *glans* form were found at Taupeka.

Live observations

Less time was spent examining live shells during this trip. Port Hutt was, however, an exception, and with the calm, fine weather, a greater area of the shoreline was exposed at low tide. As a result several *Buccinulum linea* were noted under rocks around the boat wreck in the center of the bay. It was also interesting to locate *Xymene ambiguus* living in spartan and exposed sandy rock pools at the Owenga end of Hanson bay. On the Club's first trip we were wandering if they occurred only as fossils. By the second trip we had found a few washed in alive. Their living conditions on the Chathams seemed at odds with the sheltered muddy harbours we were used to seeing them in on Stewart Island and the New Zealand mainland.

Chatham differences

It is always interesting to note those shells which are present on the Chathams that mark it as different from the New Zealand mainland and therefore make a trip there quite special. With *Turbo smaragdus* absent, *Modelia* is the common cat's eye and quite nice specimens can usually be found. *Cookia sulcata* in good condition is abundant. Of the tiger shells, *Calliostoma granti* is common while *Calliostoma punctulatum* is absent; three large *Calliostoma granti* of about 40mm were found at Taupeka and Owenga. *Buccinulum vittatum, Tanea zelandica, Lepsithais lacunosa, Melagraphia aethiops* and *Oxyperas elongata* grow to a far larger size than on the New Zealand mainland. *Trochis viridis* is pink. *Radiacmea inconspicua* is also pink, and by its shear numbers can turn the shell sand pink in some locations. *Margarella fulminata* and *Micrelenchus mortenseni* are endemic to the Chathams and can be found in shell sand. *M. mortenseni* is best located along the low tide drift line at Owenga. *Cominella nassoides iredalei* is not uncommon at Owenga near the Te One stream. *Alcithoe arabica* is absent - the main volute is *Alcithoe wilsonae* often with purple staining. We were lucky to acquire two in good condition from a fisherman who also had a broken *Charonia.* He believed these were dredged off Cape Young which would accord with the pieces of *Alcithoe wilsonae* that we found washed up at Taupeka and points closer to Cape Young.

Locations visited on this trip:

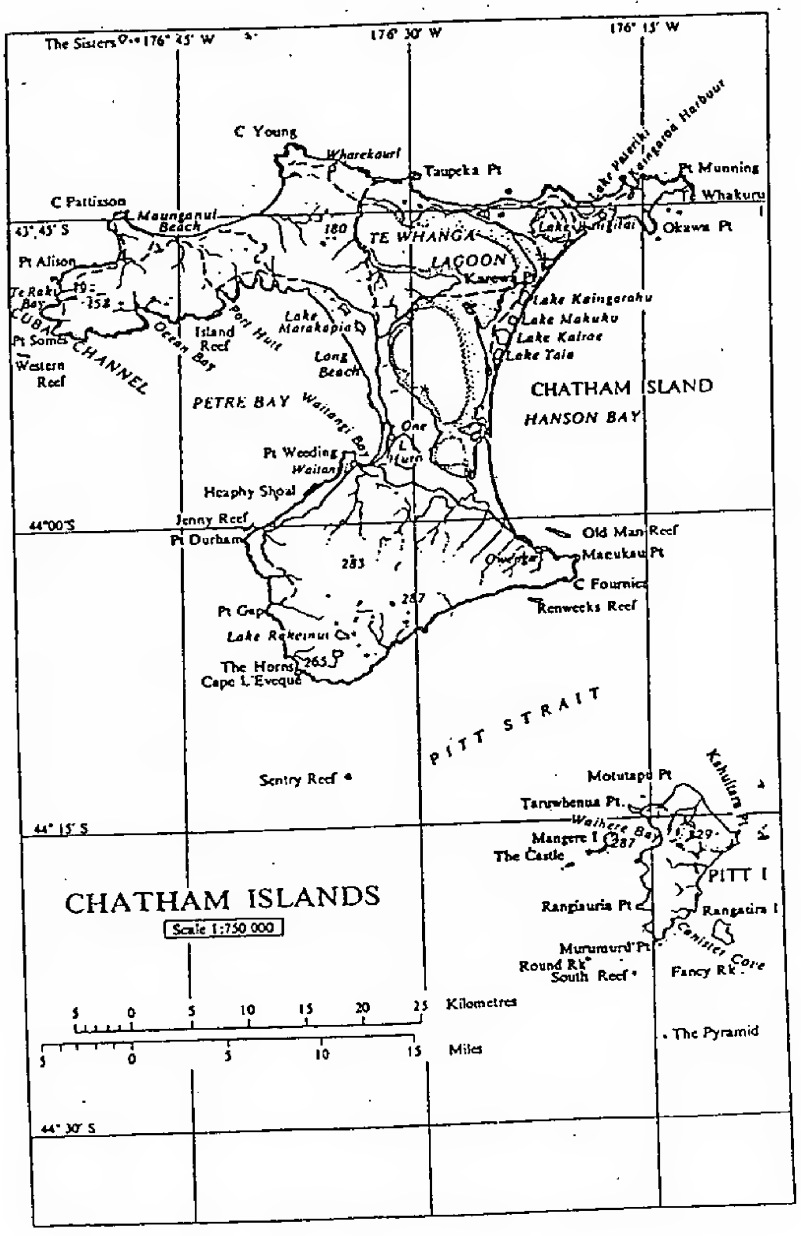
Waitangi Beach:- a long sandy beach with a steam mouth (Nairn river) at the Waitangi end where shells wash in.

Owenga south of wharf: - a good long walk at the low tide with numerous rocks interspersed with sand; comprises numerous shell washups but, to date, no exceptional shells have been found here.

Owenga from the paua factory to Te One Stream and Hanson Bay: – sandy areas mixed with rock near the paua factory; the area beyond the Te One stream consists of almost all shell.

Taupeka Point: - a long sandy beach, best accessed from the road about 1km past the Taupeka Point farm house. The Point is consists almost entirely of shell wash-ups.

Kaingaroa - end of road by fish factory:- Best to walk through from Kaingaroa harbour to the sandy beach facing north and Matarakau – some shell wash ups and shell sand here.



CHATHAM ISLAND SPECIES LIST

	Waitangi beach	Waitangi low tide sth of wharf	Owenga low tide sth of wharf	Owenga below paua factory	Owenga nth of Te One Stream	Taupeka beach	Taupeka low tide rocks	Matarakau beach	Port Hutt low tide	Kaingaroa beach	Kaingaroa low tide	Okawa Pt beach	Okawa Pt low tide	Comment	Occurrence
GASTROPODA															
Cellana strigilis chathamensis		L	L				L	D	L		L		L	Common on mid to low tide rocks	C
Radiacmea inconspicua		D		D	D	D		D		D	L			Clean specimens with pink interiors	C
Haliotis iris		L	L		D	L	L				L		L	Very common in some areas	C
Haliotis australis	D	L	L		D	D	L				L		L		C
Haliotis virginea morioria	D		D	D	D	D		D				D		Not uncommon washed ashore most localities. Best at Taupeka	C
Emarginula striatula	D	D			D	D	L	D			L	D		Very clean specimens on underside of rocks at low tide	C
Montfortula chathamensis			D	D			L	D				D		Underside of rock ledges at low tide. At Taupeka under large rocks between mussels	U/C
Tugali suteri	D	D	D	D		D	L			D			L	Under low tide rocks on sand	C
Monodilepas skinneri				D		D								**Among shell grit**	R
Cantharidus opalus cannoni	D	L	D		D	D	L	D		D	L			Grazing on brown seaweed at/ below low tide; same weed as Wellington	C
Melagraphia aethiops		L	D		D	D					L			Large at Owenga on mid tide rocks	C
Diloma nigerrima		D	D		D					D					C
Margarella fulminata		D	D	D	D	D	D	D	L	D		D		Grazing on stunted red/brown weed	C
Micrelenchus mortenseni					D	D		D						Not uncommon in shell gravel at low tide drift line at Owenga	U/C
Micrelenchus dilatatus		D	D	D		D				D		D		In shellsand	C
Trochus viridis	D	D			D	D	L	D	L	D	L			**Clean, pink specimens at Taupeka**	C
Thoristella chathamensis			D							D	D	D		In shellsand and freshly dead in rock pools	U/C
Herpetopoma alacerrima		D												**In shellsand**	R
Herpetopoma bella		D	L	D	D	D				D	L	D	L	Under stones at low tide	C
Antisolarium egenum				D	D	D						D		Not uncomon in shellsand	C
Calliostoma granti	D				D	D				D				Common and large washed up at Taupeka	C
Calliostoma waikanae					L									Two washed up live	R
Calliostoma selectum									D					Piece only	R
Calliostoma tigris	D					D		D				D		Best from crayfish pots	U/C
Modelia granosa	L	D			D	L								Commonly washed ashore with animal Best from Waitangi beach	C
Astraea heliotropium			D			D								Often in crayfish pots	U/C

L=Live; D = Dead; C = Common; U/C= Uncommon; R = Rare

CHATHAM ISLAND SPECIES LIST

	Waitangi beach	Waitangi low tide sth of wharf	Owenga low tide sth of wharf	Owenga below paua factory	Owenga nth of Te One Stream	Taupeka beach	Taupeka low tide rocks	Matarakau beach	Port Hutt low tide	Kaingaroa beach	Kaingaroa low tide	Okawa Pt beach	Okawa Pt low tide	Comment	Occurrence
Cookia sulcata	L	L			D	D					L			Very common just below low tide and on Waitangi beach	C
Turbo smaragdus	D													**Old specimen at river mouth**	R
Zeacumantus subcarinatus		D	D		D	D			L			D		Fine clean condition under stones at mid tide	
Maoricolpus roseus	D				L	D								Washed in live imbedded with sea squirts	C
Austrolittorina cincta		L				D						D		Small; on high tide rocks	
Risellopsis varia		D			D	D				D		D		Larger than on mainland, common in shellsand	C
Rissoina chathamensis.		D			D	D			L		L	D		On the underside of rocks with weed. Common in shellsand	C
Dolicrossea vesca		D								D	D	D		In shellsand	
Sigapatella novaezelandiae	D	D			D	D	L	D	L					On the underside of large rocks at low tide	C
Trichosirius inornatus		D						D		D				In shell sand; of large size	C
Tanea zelandica	D				L	D				D	D			Very large, washed ashore some still with animal/ operculum	C
Uberella vitrea				D										Shellsand	
Semicassis pyrum					D	D								Washed in with animal and operculum at Owenga	
Cabestana spengleri	D				D	D								Washed ashore. Best specimens from Waitangi beach	U/C
Charonia lampas										D				**Obtained from fisherman**	
Argobuccinum tumidum	D				D	D								Commonly washed ashore	C
Seila cincta		D			D	D				D		D		In shellsand	U/C
Janthina exigua					D	D		D							U/C
Janthina janthina		D													
Poirieria zelandica						D				D				Several obtained from fisherman at Kaingaroa; short, stunted spines	R
Terefundus crassiliratus												D		In shellsand	
Xymene ambiguus	D				L	D								**Live in rock pools Owenga end of Hanson bay**	U/C
Xymene plebeius					D										
Xymene traversi		L		D	D	D		D	L	D	L	D		Under rock ledges at low tide. Common and large at Matarakau	C
Lepsiella scobina											L		L	On midtide rocks	U/C
Haustrum haustorium		L	L			D	L		L		L			Common at Waitangi, midtide rocks	C

L=Live; D = Dead; C = Common; U/C= Uncommon; R = Rare

CHATHAM ISLAND SPECIES LIST

	Waitangi beach	Waitangi low tide sth of wharf	Owenga low tide sth of wharf	Owenga below paua factory	Owenga nth of Te One Stream	Taupeka beach	Taupeka low tide rocks	Matarakau beach	Port Hutt low tide	Kaingaroa beach	Kaingaroa low tide	Okawa Pt beach	Okawa Pt low tide	Comment	Occurrence
Lepsithais lacunosa	D				D	D		D						Common washed ashore, large, not seen live at low tide	C
Cominella adspersa	D				D	D									
Cominella maculosa	D	L	L		D	D	L		L		L			Common out crawling at low tide; clean specimens some part orange	C
Cominella glandiformis			L		D										
Cominella nassoides iredalei	D				L	D								Best at Owenga	U/C
Austrofusus glans					D	D									U/C
Austrofusus chathamensis					D	D								Commonly washed ashore. Generally worn appearance	C
Buccinulum linea	D		L		D	D	L	D	L					West coast specimens are wide lined (*waitangiensis* variety). Part buried on sandy bottom or ledges	C
Buccinulum pertinax	D				D	D	L				L			Uncommon intertidally. All pinkish, jeuvenile, knobbed (*marwicki* form) other than one smooth, all white, alive in 12 cm. water at Taupeka	U/C
Buccinulum vittatum bicinctum		D	L		D	D	L	D	L		L		L	Very common; largest at Taupeka. Most are wide lined black/white and co-existing with all white ones. Orange/brown colour at Port Hutt	C
Macrozafra subabnormis		D												**In shellsand**	
Paxula allani												D		In shellsand	U/C
Paxula subantarctica				D		D					D	D		In shellsand. Freshly dead at Kaingaroa	U/C
Alcithoe wilsonae					D	D								Several beached almost whole specimens	R
Provocator mirabilis						D								**Almost whole specimen**	R
Dentimargo cairoma											L	D		One live under low tide rock in about 10cm of water. Animal bright yellow; shell transparent; central stripe and red markings on lip	U/C
Austromitra rubiginosa		D			D	D				D		D		In shellsand, large, pinkish	C
Neoguraleus lyallensis				D							L	D	D	In shellsand. On underside of low tide rocks	C

L=Live; D = Dead; C = Common; U/C= Uncommon; R = Rare

CHATHAM ISLAND SPECIES LIST

	Waitangi beach	Waitangi low tide sth of wharf	Owenga low tide sth of wharf	Owenga below paua factory	Owenga nth of Te One Stream	Taupeka beach	Taupeka low tide rocks	Matarakau beach	Port Hutt low tide	Kaingaroa beach	Kaingaroa low tide	Okawa Pt beach	Okawa Pt low tide	Comment	Occurrence
Neoguraleus murdochi		D				**D**					L			In shellsand	**C**
Neoguraleus sinclairi												**D**		**In shellsand**	
Liracraea epentroma												**D**		**In shellsand**	**R**
Turbonilla moorei				D								D		In shellsand	
Doris wellingtonensis		L	L											In low tide pools	
Trimusculus conicus		D		D		**D**		D		D				Common in shellsand at Matarakau	**C**
Siphonaria australis		L	**D**			**D**	L							On mid to low tide rocks	**C**
Siphonaria propria		**D**				**D**									
Marinula filholi		D			D							D		In shellsand	
BIVALVIA															
Nucula nitidula		**D**													
Barbatia novaezealandiae	D		**D**		L	D								Washed in live at Owenga	
Tucetona laticostata					L	D								Washed in live at Owenga	
Aulacomya atra maoriana	D	**D**			D	D								Commonly washed ashore	**C**
Modiolus areolatus	D				L	D								Small size. Washed ashore live at Owenga	**C**
Modiolarca impacta	D				L	D								Imbeded with sea squirts washed ashore at Owenga	**C**
Trichomusculus barbatus		**D**				**D**					L			On the underside of low tide rock	
Ostrea chilensis	D														
Pecten novaezelandiae					D	**D**								Dredged single valves common	**C**
Talochlamys zelandiae	D	**D**			L	D								Lots cast ashore in sponge at Owenga; all colours some live	**C**
Talochlamys gemmulata					D	D								Some 'doubles' cast ashore at Taupeka, large size	**R**
Pododesmus zelandicus					L									In Owenga washup	
Limatula maoria					**D**										
Divalucina cumingi						D									
Diplodonta striatula		**D**				D									
Felaniella zelandica			**D**												
Lasaea hinemoa												D		In shellsand	
Borneola reniformis		D								D				In shellsand	
Myllitella vivens pinguis		**D**				D						D		In shellsand	
Cardita aoteana					D	D	L	D			L			Small on the underside of rocks at low tide	**C**
Purpurocardia purpurata					D										**R**
Oxyperas elongata					L	**D**								Washed ashore live 92mm x 60mm	**U/C**

L=Live; D = Dead; C = Common; U/C= Uncommon; R = Rare

CHATHAM ISLAND SPECIES LIST

	Waitangi beach	Waitangi low tide sth of wharf	Owenga low tide sth of wharf	Owenga below paua factory	Owenga nth of Te One Stream	Taupeka beach	Taupeka low tide rocks	Matarakau beach	Port Hutt low tide	Kaingaroa beach	Kaingaroa low tide	Okawa Pt beach	Okawa Pt low tide	Comment	Occurrence
Scalpomactra scapellum								D							
Paphies subtriangulata	D					D									
Pseudarcopagia disculus	D	D			D	D	L					D		Buried in sand under low tide rocks, nice shiny yellow at Okawa	C
Macomona liliana					D										
Gari convexa	D				L									Large red coloured specimens. Some washed in live at Owenga	C
Gari stangeri					L									Large (some live) at Owenga	C
Soletellina nitida	D					D								Nice speciemens with periostracum	
Austrovenus stutchburyi					D										
Dosinia maoriana					L	D								Large size 40 x 40mm washed in	
Irus reflexus		D				D									
Ruditapes largillierti	D				D				D						
Panopea smithae					D										
Barnea similis	D	D												'Doubles' commonly washed ashore	

L=Live; D = Dead; C = Common; U/C= Uncommon; R = Rare

DISTRIBUTION OF MARINE MOLLUSCS ALONG THE TEMPERATE AND COLD WATER REGIONS OF THE SOUTHERN OCEAN AND ADJOINING ZONES

By ZVI ORLIN

Key Words
Mollusca, Southern Ocean, biogeography, distribution, endemism, marine, adjoining zones.

ABSTRACT

A list is presented of the recent taxa shared by the neighbouring regions of the Southern Ocean. Differences are pointed out between the zones studied, and regions discussed. Altogether, 450 taxa are listed: most occur mainly in 2 regions only, but 16 species and 70 genera are found in 3 regions, and even less occur in 3 or 4 regions, situations regarded as typical of temperate and cold water habitats.

INTRODUCTION

Noting during my collection of marine shells worldwide that many taxa in the Southern Hemisphere are found in regions widely separated, a special study was launched of the remote regions in and around the Southern Ocean, concentrating on the following five regions:

1. New Zealand – North and South Islands, including nearby offshore Islands, Kermadec 28° S. Chatham, and the antipodean Subantarctic Islands 50° S.
2. Australia – the temperate South Coast and overlap zones on the West coast from Shark Bay 25° S. to the East coast at the North border of N.S.W. 28° S. including Norfolk Island.
3. South Africa – the Temperate South coast from Margate 31°S. to the West Coasts at Swakopmund 28° S.
4. Magellanic Region – Southern Argentine, from Peninsula Valdez 42° S. to Ancud on Chiloe Island 42° S. in Southern Chile, including the Falkland Islands.
5. Antarctica Region – the Antarctic Continent and islands of the Southern Ocean south of 50° S. but including Kerguelen, Crozet and Prince Edward Islands.
6.

The borders of the regions were determined mainly by the sources of information – see 'References'.

A high degree of endemism is found in the above regions: New Zealand heads the list with 76%, South Africa 52%, in the Magellanic Region of 627 species recorded by Forcelli (2000), 35% are endemics; for Australia no detailed information has been released so far, but after personal communications with the authors: of F.E.Wells's [2000] 671 species described of West Australian shells about 40% are endemic to Australia, and of P. Jansen's [2000] 414 species described of South-East Australian shells about 80% are endemic to Australia. These are only partial and preliminary figures; regarding the Antarctic Region, according to the best of my knowledge, no final figures are available.

Owing to the high degree of endemism, shared species of these five regions are not too common, so the generic level was also noted. These genera are usually found largely in the regions noted, with some spreading into adjoining regions, and most of their species are endemic, in the regions in which they are found.

RESULTS

Summing up the results, 176 families shared species and genera in the different regions:

	Australia	New Zealand	Magellanic	Antarctic	South Africa
Australia		108 spp., 157 g	8 spp., 71 g	2 spp., 52 g	21 spp., 38g
New Zealand	108 spp., 157 g		23 spp., 95	10 spp., 73 g	19 spp., 40g
Magellanic	8 spp., 71g	23 spp., 95 g		100 spp., 32 g	7 spp., 22 g
Antarctic	2 spp., 52 g	10 spp., 73 g	100 spp., 32 g		5 spp., 14 g
South Africa	21 spp., 38 g	19 spp., 40 g	7 spp., 22 g	5 spp., 14 g	

DISCUSSION

According to these results, geographic proximity is of primary importance in determining this distribution. Species similarity usually decreases with geographical distance and is influenced by dispersal limitation. Climatic conditions are an additional important factor, especially in regions where successive Ice Ages are predominant, like the Magellanic and Antarctic Regions and New Zealand. Such changes no doubt effected the evolution and survival of many taxa. Prevailing ocean currents may also be a contributory factor, with the continuous West Wind Drift encircling the globe in the Southern Hemisphere, reaching the regions in this survey, especially for free swimming larval stages of development of some species. Hopefully more research will follow in recording the extent of these migrations. Man is the fourth factor affecting distribution, and is becoming increasingly important, both with his effect on the environment, and the wide range of his vessels crossing the oceans, in increasing numbers; also his deliberate introduction of species for commercial reasons, and the occasional transfer for study purposes, which by mistake or inadvertently are released to the environment.

Australia and New Zealand, only separated by the Tasman Sea, have the greatest affinity according to the shared number of taxa shown in the subsequent list, and are influenced by all four of the above factors. The reason for this largest number of shared taxa, is that both reach into lower latitudes, and subsequently into more favorable climatic conditions. Likewise the Magellan and Antarctic Regions, separated by the Drake Passage, are even closer together, and are also affected by all four factors. Worthy of note is the unusual fact, that the shared species of the latter two regions are more than double than the shared genera (100 species to 32 genera). In all other zones the number of genera far exceeds the number of species, owing to the eventual evolution of endemic species in many genera. This is due to the relative closer proximity, and more similar climatic conditions. South Africa is the odd one out: surrounded by vast expanses of oceans of thousands of kilometers between it and the other continental regions, its molluscan fauna is more linked to the African countries north, with relatively fewer shared taxa than the other regions in this study.

Perhaps the most interesting fact, is the high number of shared taxa between the Magellanic Region and New Zealand, despite the tremendous distance between them. This may be partly accounted for by the relative proximity in former geological eras, when they were in close proximity, prior to extensive continental plate drift. We must, however, take into account, that during those geological eras both South Africa and Australia were also near the present Magellanic Region; this stresses the importance of climatic factors, as the latter's climates are currently more diverse, as they drifted further north from Antarctica. This subject is better left for the palaeobiogeographers, and their findings will be welcomed.

REMARKS

An endeavour has been made to relate to species and genera of largely temperate and cold water regions, but this is to some degree subjective and depends on the sources of information used, of which mine are regrettably incomplete; many of the cosmopolitan species or genera were not included, as they were considered predominantly tropical and subtropical in distribution. It must be remembered, however, that the temperature of the oceans varies in depth, and therefore some of the species or genera found in subtropical or tropical regions, at the edge of, or below the continental shelf, may well live in temperate or cold water habitats. Some of the taxa are also found in temperate and cold water regions of the Northern Hemisphere, and it is considered that these northern genera include many bipolar taxa in the regions of discussion, especially in the Magellanic and Antarctic Regions.

Most of the taxa in the list were found mainly in 2 regions only, but 16 species and 70 genera were found in 3 regions, and even fewer are found in 4 or 5 regions. Altogether 450 taxa appear in the list, yet relatively few are found in more than 2 regions; this seems typical of temperate and cold water habitats, that limit distribution, owing to more adverse climatic conditions. In contrast, in tropical and subtropical habitats, distribution is far wider, often extending from island to island, or along continental coasts, over one or two oceans. For example, over 200 species found along South Africa's subtropical east coast, are also found in the Red Sea, at the northern end of the Indian Ocean, and many hundreds of other species are also found scattered over the tropical Indo-Pacific Ocean.

Owing to the differences of opinions between taxonomists, in some cases alternative names are used for the same genera, occasionally subgenera names are elevated to genera level; in these cases the alternatives have been inserted in parenthesis. Some subfamilies have also been elevated to family level, but the reasons are still being debated, and often the changes are reverted.

This as a preliminary survey, which will hopefully be followed by more detailed studies, and the publication of additional information. The main purpose of this article is to draw attention to some of the remotest regions of our planet, with their biodiversity in molluscs, and the affinity of these regions in shared taxa.

ACKNOWLEGEMENTS

I would like to thank: Bruce Marshall of the Museum of New Zealand Te Papa Tongarewa, for reading the draft of this article, and adding valuable additional information and suggestions; Robert Lynch of the Royal Society of New Zealand, for granting Copyright permission for the use of a location map from one of their Bulletins, which appears in this article; Henk Mienis for his assistance in placing at my disposal all the relevant literature available in the Hebrew University of Jerusalem libraries, and Dr Ilan Karplus of the Volcani Institute in Rehovot, and my colleague Shai Shafirof the staff of Oranim University, for suggesting some important changes which helped improve the context.

REFERENCES

BARNARD, K.H. 1963: Deep-sea Mollusca from the Region South of Madagascar. *Division of Sea Fisheries Investigation Report* No. 44: 1-19.

BEESLEY, P.L.; ROSS, G.J.B.; WELLS, A. (eds), 1998: Mollusca: The Southern Synthesis, Fauna of Australia, Vol. 5 (Parts A. & B.) *Csiro Publishing House, Melbourne.* 1234 pp.

BRITISH ANTARCTIC SURVEY. Southern Ocean Mollusc Data Base (SOMBASE). Updated January 2004. Electronic document available at:
www.antarctica.ac.uk/BAS_Science/Programmes?ABPPF/SOMBASE/Bivalve_species/species

DELL, R.K. 1990: Antarctic Mollusca: with special reference to the fauna of the Ross Sea. *Royal Society of New Zealand Bulletin* 27: 1-311.

FORCELLI, D.O. 2000 : *Molluscos Magallanicos, Guia de Molluscos de Patagonia y Sur de Chile.* Vasquez Mazzini Editores, Buenos Aires. 200pp.

GIBBONS, M.J. *et al.* 1999 : The taxonomic richness of South Africa's marine fauna: a crisis at hand. *South African Journal of Science* 95: 9-12.

GOSLINER, T.M. 1987: *Nudibranchs of Southern Africa. A Guide to Opisthobranch Molluscs of Southern Africa.* Sea Challengers & J.Hamann in Association with the California Academy of Sciences, Monterrey. 136pp.

GOTTING, K.J. 1989: Los Poliplacoforos de las Regiones Antarcticas y Subantarcticas. *Medio Ambiente* 10(2): 54-60

HERBERT, D.G. 1992/1993 : Revision of Trochidae. *Annals of the Natal Museum* 33 (2): 379-459; 34(2): 239-308.

HERBERT, D.G. 1986: A revision of the southern African Scissurellidae. *Annals of the Natal Museum* 27 (2): 601-632.

JANSEN, P. 2000: *Seashells of South-East Australia.* Capricornica Publications, Lindfield NSW. 118pp.

JONKERS, H.A. 2003: Late Cenozoic to Recent Pectinidae of the Southern Ocean & Neighboring Regions. *Monographs of Marine Mollusca* No.5. Backhuys Publishers, Leyden.

KILBURN, R.N. 1983-1995: Turridae of Southern Africa & Mozambique Parts 1-7. *Annals of the. Natal Museum.*

KILBURN, R.N. 1985: The family Epitoniidae in Southern Africa & Mozambique. *Annals of the Natal Museum* 27 (1): 239-337.

LAMPRELL, K.; HEALY, J., 1998: *Bivalves of Australia* Vol.2. Backhuys Publishers, Leyden. 288pp.

LAMPRELL, K.; WHITEHEAD, T. 1992: *Bivalves of Australia* Vol.1. Crawford House Press, Bathurst.182pp.

LINSE, K., 2002: *Shelled Magellanic Mollusca: with Special Reference to Biogeographical Relations in the Southern Ocean (Appendix: Species List & Biogeographic Database).* Koeltz Scientific Books, Germany. 252pp.

SCHRODL M. 2003: *Sea Slugs of Southern South America.* Conchbooks, Hackenheim, Germany. 165pp.

SPENCER, H.G.; WILLAN, R.C.; MARSHALL, B.A.; MURRAY, T.J. 2002: Checklist of the Recent Mollusca Described from the New Zealand Exclusive Economic Zone. 116pp. Electronic document available at: http://toroa.otago.ac.nz/pubs/spencer/Molluscs/index.html

STEYN, D.G.; LUSSI, M. 1998: *Marine Shells of South Africa.* Ekogilde Publishers, Hartebeespoort. 264pp.

WELLS, F.E.; BRYCE, C.W. 2000: *Seashells of Western Australia.* Western Australian Museum, Perth. 207pp.

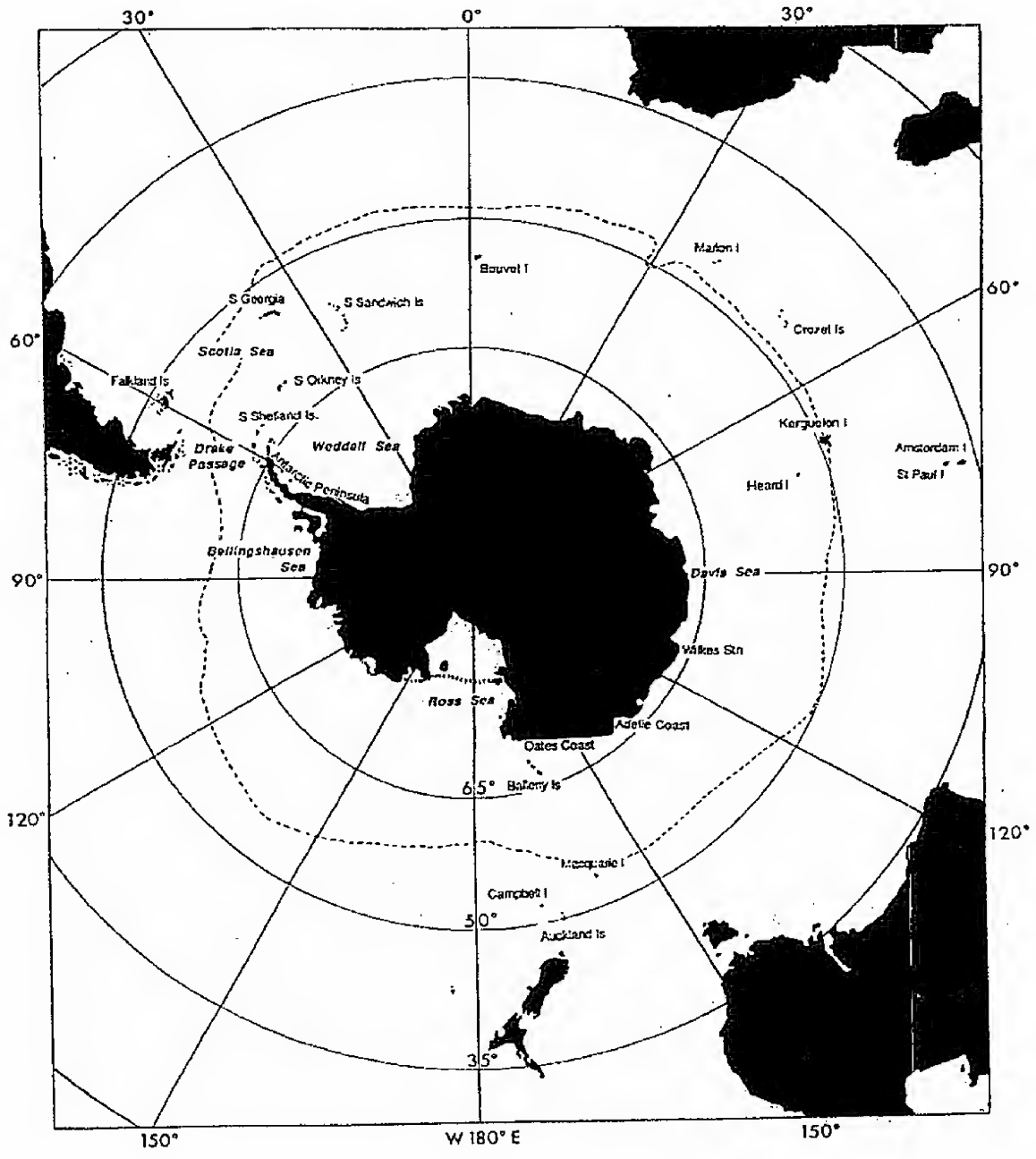
WILSON, B. 1993/1994: *Australian Marine Shells.* Odyssey Publishers, Kallaroo.Vol.1: 408pp; Vol.2: 370pp.

VOSS, G.L. 1988: The biogeography of the deep-sea Octopoda. *Malacologia* 29 (1): 295-307.

β β β

LOCATION MAP

Original source: Dell, R.K. 1990: Antarctic Mollusca: with special reference to the fauna of the Ross Sea. *Royal Society of New Zealand Bulletin 27*: page 274, map. (Reproduced by permission of The Royal Society of New Zealand).



LOCATION MAP

Original source: Dell, R.K. 1990: Antarctic Mollusca: with special reference to the fauna of the Ross Sea. *Royal Society of New Zealand Bulletin 27*: page 274, map. (Reproduced by permission of The Royal Society of New Zealand).

Family	Antarctic Region	Magellanic Region	South Africa	Australia	New Zealand
Nacellidae	*Nacella concinna* *Nacella mytilina*	*Nacella concinna* *Nacella mytilina*			
Lepetidae	*Iothia coppingeri*	*Iothia coppingeri*			
Lottiidae	*Notoacmea* *Actinoleuca*			*Notoacmea*	*Notoacmea* *Actinoleuca*
Cocculinidae				*Coccopygia crinita*	*Coccopygia crinita*
Pseudococculinidae				*Pseudococculina gregaria* *Notocrater* *Kuritabyssia antipodensis*	*Pseudococculina gregaria* *Notocrater* *Kuritabyssia antipodensis*
Scissurellidae	*Scissurella timora* *Sinezona*	*Scissurella timora*	*Sinezona* *Sukashitrochus*	*Sinezona* *Scissurona (= Incisura) rosea*	*Sinezona* *Incisura rosea* *Sukashitrochus*
Fissurellidae	*Parmaphoridea (=Tugali)* *Puncturella conica*	*Tugali* *Puncturella conica* *Pupilaea*	*Tugali* *Pupilaea* *Amblychilepas* *Cosmetalepas* *Macroschisma*	*Tugali* *Amblychilepas* *Cosmetalepas* *Montfortula* *Macroschisma*	*Tugali* *Montfortula* *Puncturella*
Trochidae	*Antimargarita* *Margarella* *Photinula caerulescens* *Photinula expansa* *Cantharidus*	*Margarella* *Photinula caerulescens* *Cantharidus* *Calliotropis* *Solariella* *Diloma nigerrima* *Otukaia* *Photinula expansa*	*Diloma* *Cantharidus* *Granata*	*Cantharidus* *Calliotropis* *Clanculus* *Granata* *Herpetopoma*	*Antimargarita* *Brookula* *Otukaia* s.gen. *Clanculus* *Calliotropis* *Diloma nigerrima* *Herpetopoma* *Cantharidus* *Solariella* *Margarella*
Turbinidae			*Bolma*	*Argalista* *Munditia* *Bolma*	*Argalista* *Munditia* *Bolma*
Skeneidae (Cyclostrematidae)	*Brookula* *Cyclostrema crassiolatum* *Cirsonella* *Lissotesta* *Liotella*	*Brookula* *Cyclostrema crassiolatum* *Cirsonella*	*Brookula*	*Brookula* *Lissotesta* *Liotella* *Lodderena*	*Cirsonella* *Lissotesta* *Lodderena*
Seguenziidae	*Seguenzia antarctica*		*Seguenzia antarctica*	*Seguenzia*	*Seguenzia*
Neritidae				*Nerita atramentosa*	*Nerita atramentosa*
Turritellidae	*Colpospirella algida*	*Colpospirella algida*		*Maoricolpus roseus* (introduced from NZ)	*Maoricolpus roseus*
Siliquariidae				*Tenagodus weldii* *Stephopoma*	*Tenagodus weldii* *Stephopoma*
Batillariidae				*Zeacumantus subcarinatus* (introduced from N Z)	*Zeacumantus subcarinatus*
Littorinidae	*Laevilitorina calignosa* *Macquariella*	*Laevilitorina calignosa*		*Laevilitorina* *Austrolittorina*	*Laevilitorina* *Austrolittorina* *Macquariella*
Eatoniellidae	*Eatoniella cana*	*Eatoniella cana* *Pupatonia*		*Eatoniella* *Crassitoniella*	*Eatoniella* *Pupatonia* *Crassitoniella*
Cingulopsidae	*Skenella georgiana*	*Skenella georgiana*		*Skenella* *Tubbreva*	*Skenella* *Tubbreva*
Rastodentidae				*Rastodens*	*Rastodens*
Barleeidae		*Fictonoba*			*Fictonoba*
Anabathridae	*Pisinna* *Anabathron*		*Pisinna* *Microdryas*	*Microdryas* *Anabathron* *Amphithalamus*	*Microdryas* *Anabathron* *Amphithalamus*
Rissoidae	*Powellisetia australis* *Onoba georgiana*	*Powellisetia australis* *Onoba georgiana* *Pusillina*		*Powellisetia* *Lironoba*	*Powellisetia australis* *Onoba* *Pusillina* *Lironoba*
Elachisinidae				*Dolicrossea*	*Dolicrossea*

Family	Antarctic Region	Magellanic Region	South Africa	Australia	New Zealand
Vitrinellidae				*Elachorbis*	*Elachorbis*
Triviidae				*Trivia merces*	*Trivia merces*
Velutinidae	*Marseniopsis pacifica*	*Marseniopsis pacifica*		*Mysticoncha*	*Mysticoncha*
Naticidae	*Amauropsis* *Falsilunatia* *Sinuber s. sculptum* *Friginatica* *Tectonatica impervia*	*Amauropsis* *Falsilunatia* *Sinuber s. sculptum* *Tectonatica impervia*	*Tanea*	*Tanea* *Friginatica*	*Tanea* *Friginatica* *Falsilunatia*
Bursidae				*Bursa verrucosa*	*Bursa verrucosa*
Cassidae			*Semicassis pyrum* *Semicassis labiata*	*Semicassis pyrum* *Semicassis labiata* *Semicassis royana* *Semicassis thomsoni*	*Semicassis pyrum* *Semicassis labiata* *Semicassis royana* *Semicassis thomsoni*
Ficidae			*Thallassocyon bonus*	*Thalassocyon bonus*	*Thalassocyon bonus*
Laubierinidae				*Akibumia orientalis*	*Akibumia orientalis*
Ranellidae		*Argobuccinum pustulosum* *Fusitriton magellanicus*	*Argobuccinum pustulosum* *Ranella australasia* *Charonia lampas*	*Argobuccinum pustulosum* *Ranella australasia* *Fusitriton magellanicus* *Charonia lampas rubicunda*	*Argobuccinum pustulosum* *Ranella australasia* *Fusitriton magellanicus* *Charonia lampas rubicunda*
Tonnidae			*Tonna variegata*	*Tonna variegata cerevisina* (s.s ?) *Tonna tetracotula*	*Tonna cerevisina* *Tonna tetracotula*
Atlantidae				*Atlanta turriculata*	*Atlanta turriculata*
Carinariidae				*Carinaria lamarcki*	*Carinaria lamarcki*
Pterotracheidae				*Pterotrachea scutata*	*Pterotrachea scutata*
Triphoridae				*Metaxia* *Teretriphora* *Nototriphora* *Monophorus* *Sagenotriphora ampulla*	*Metaxia* *Teretriphora* *Nototriphora* *Monophorus* *Sagenotriphora ampulla*
Cerithiopsidae	*Ataxocerithium* *Eumetula* *Cerithiopsilla* *Cerithiella*	*Ataxocerithium* *Eumetula* *Cerithiopsilla*		*Ataxocerithium* *Zaclys* *Specula* *Socienna* *Prolixodens infracolor*	*Ataxocerithium* *Zaclys* *Specula* *Socienna* *Cerithiella* *Eumetula* *Prolixodens infracolor*
Janthinidae			*Recluzia rollandiana*	*Recluzia*	*Recluzia rollandiana*
Epitoniidae	*Acirsa* *Asperiscala eltanini*	*Acirsa* *Asperiscala eltanini* *Papuliscala*		*Murdochella* *Opalia* *Epitonium jukesianum*	*Acirsa* *Papuliscala* *Murdochella* *Opalia* *Epitonium jukesianum*
Eulimidae	*Balcis antartica* *Balcis subantarcticus*	*Balcis antarctica* *Balcis subantarcticus* *Pelseneeria*		*Pelseneeria* *Fusceulima*	*Pelseneeria* *Fusceulima*
Muricidae	*Trophon geversianus* *Trophon ohlini* *Trophon laciniatus* *Xymenopsis muriciformis*	*Trophon geversianus* *Trophon ohlini* *Trophon laciniatus* *Xymenopsis muriciformis*	*Murexsul* *Neothais (=Dicathais) orbita*	*Dicathais orbita* *Prototyphis* *Syphochelus* *Phyllocoma speciosa* *Lepsiella* *Haustrum* *Babelomurex lischkeanus*	*Murexsul* *Prototyphis* *Dicathais orbita* *Syphochelus* *Lepsiella* *Phyllocoma speciosa* *Babelomurex lischkeanus* *Haustrum*

Family	Antarctic Region	Magellanic Region	South Africa	Australia	New Zealand
Turbinellidae			*Coluzea*	*Coluzea*	*Coluzea*
Buccinidae	*Antarctodomus* *Falsitromina* *Pareuthria* *Meteuthria* *Chrysodomus*	*Falsitromina* *Aeneator* *Pareuthria* *Meteuthria* *Chrysodomus*	*Cominella* *Ratifusus*	*Cominella* *Penion* *Ratifusus adjunctus* *Ratifusus reticulatus*	*Antarctodomus* *Aeneator* *Pareuthria* *Cominella* *Penion* *Cumia (=Ratifusus) adjuncta* *Cumia reticulata*
Nassariidae			*Nassarius kraussianus*	*Nassarius ephamillus* *Nassarius spiratus* *Nassarius kraussianus*	*Nassarius ephamillus* *Nassarius spiratus*
Volutidae	*Miomelon turnerae* *Miomelon eltanini* *Provocator pulcher* *Guivillea* *Tractolira*	*Miomelon turnerae* *Miomelon eltanini* *Provocator pulcher* *Guivillea* *Tractolira*	*Lyria*	*Lyria nucleus*	*Lyria nucleus* *Provocator*
Olividae	*Baryspira longispira*	*Baryspira longispira*		*Amalda (Baryspira)* *Gracilispira*	*Amalda (Baryspira)* *Amalda (Gracilispira)*
Harpidae				*Morum bruuni*	*Morum bruuni*
Marginellidae				*Dentimargo* *Mesoginella* *Ovaginella*	*Dentimargo* *Mesoginella* *Ovaginella*
Cystiscidae			*Cystiscus*	*Cystiscus*	*Cystiscus*
Mitridae				*Mitra carbonaria*	*Mitra carbonaria*
Volutomitridae	*Volutomitra fragillima* *Volutamitra porcellana*	*Volutomitra fragillima* *Volutomitra porcellana*	*Microvoluta*	*Volutomitra (Waimatea) obscura* *Microvoluta* *Peculator porphyria*	*Volutomitra obscura* *Microvoluta* *Peculator porphyria*
Costellariidae			*Austromitra*	*Austromitra*	*Austromitra*
Cancellariidae	*Admete*	*Admete* *Zeadmete*	*Zeadmete*	*Zeadmete* *Inglisella* *Bonellitia*	*Zeadmete* *Admete* *Inglisella* *Bonellitia*
Turridae	*Aforia lepta* *Aforia staminea* *Leucosyrinx* *Belalora theilei* *Mangelia michaelseni*	*Aforia staminea* *Drillia* *Leucosyrinx* *Belalora theilei* *Mangelia michaelseni* *Agladrillia*	*Agladrillia* *Drillia* *Splendrillia* *Taranis* *Maoritomella* *Maorimorpha* *Mitramorpha* *Antiguraleus*	*Splendrillia* *Maoritomella* *Austrodrillia*	*Aforia lepta* *Leucosyrinx* *Taranis* *Splendrillia* *Maoritomella* *Maorimorpha* *Antiguraleus* *Mitramorpha* *Austrodrillia*
Terebridae				*Terebra tristis*	*(Terebra)Pervicacia tristis*
Conidae				*Conus howelli*	*Conus howelli*
Orbitestellidae	*Microdiscula*	*Microdiscula* *Orbitestella*		*Orbitestella*	*Orbitestella*
Xylodisculidae				*Xylodiscula*	*Xylodiscula*
Mathildidae	*Mathilda*	*Mathilda*		*Opimilda decorata* *Mathilda*	*Opimilda decorata* *Mathilda*
Architectonicidae				*Adelphotectonica reevei* *Philippia lutea* *Pseudotorinia*	*Adelphotectonica reevei* *Philippia lutea* *Pseudotorinia*
Omalogyridae	*Omalogyra antarctica*	*Omalogyra antarctica*		*Omalogyra*	*Omalogyra*
Pyramidellidae	*Chemnitzia.* *Turbonilla smithi*	*Chemnitzia* *Eulimella* *Turbonilla smithi*		*Eulimella* *Linopyrga* *Chemnitzia* *Turbonilla*	*Chemnitzia* *Eulimella* *Linopyrga*
Acteonidae	*Neactaeonina*				*Neactaeonina*

Family	Antarctic Region	Magellanic Region	South Africa	Australia	New Zealand
Hydatinidae			*Hydatina albocincta*		*Hydatina albocincta*
Diaphanidae	*Diaphana paessleri* *Toledonia parelata* *Toledonia punctata* *Toledonia limnaeformis*	*Diaphana paessleri* *Toledonia parelata* *Toledonia punctata* *Toledonia limnaeformis*		*Diaphana brazieri* *Diaphana tasmanica*	*Toledonia* *Diaphana brazieri* *Diaphana tasmanica*
Cylichnidae				*Cylichna thetidis,* *Tornatina*	*Cylichna thetidis* *Tornatina*
Retusidae	*Cylichnina*	*Cylichnina*	*Volvulella*		*Cylichnina* *Volvulella*
Philinidae	*Philine alata* *Philine kerguelensis*	*Philine alata* *Philine kerguelensis*		*Philine angasi*	*Philine angasi*
Aglajidae				*Melanochlamys* *Philinopsis taronga*	*Melanochlamys* *Philinopsis taronga*
Gastropteridae	*Gastropteron*		*Gastropteron*	*Gastropteron*	
Haminoeidae				*Limulatys*	*Limulatys*
Bullidae				*Bulla angasi* *Bulla quoyii*	*Bulla angasi* *Bulla quoyii*
Plakobranchidae				*Elysia maoria*	*Elysia maoria*
Limapontiidae		*Ercolania* *Limapontia*		*Ercolania,* *Limapontia*	*Ercolania,* *Limapontia*
Aplysiidae				*Aplysia juliana* *Aplysia parvula*	*Aplysia juliana* *Aplysia parvula*
Pleurobranchidae	*Bathyberthella*	*Berthella*	*Pleurobranchaea*	*Berthella medietas* *Pleurobranchaea maculata*	*Bathyberthella* *Berthella medietas* *Pleurobranchaea maculata*
Limacinidae	*Limacina helicina*	*Limacina helicina* *Limacina retroversa*	*Limacina helicina*	*Limacina helicina*	*Limacina helicina* *Limacina retroversa*
Cavolinidae		*Clio antarctica*			*Clio antarctica*
Pneumodermatidae	*Schizobrachium polycotylum*	*Spongiobranchea australis*	*Spongiobranchea australis*	*Spongiobranchea australis*	*Spongiobranchea australis* *Schizobrachium polycotylum*
Clionidae	*Clione limacina antarctica*	*Clione limacina antarctica*	*Clione limacina*	*Clione limacina antarctica* *Thliptodon*	*Thliptodon*
Goniodorididae		*Okenia*		*Okenia pellucida* *Trapania brunnea*	*Okenia pellucida* *Trapania brunnea*
Onchidorididae		*Acanthodoris*	*Acanthodoris*	*Acanthodoris*	*Acanthodoris*
Polyceridae		*Polycera* *Thecasera*	*Polycera capensis* *Polycera hedgpethi*	*Polycera capensis* *Polycera hedgpethi*	*Polycera hedgpethi* *Thecasera*
Doridídae	*Austrodoris kerguelensis*	*Austrodoris kerguelensis* *Archidoris*		*Archidoris wellingtonensis*	*Archidoris wellingtonensis*
Chromodorididae	*Cadlina*	*Cadlina*	*Cadlina*	*Cadlina*	*Cadlina*
Tritoniidae	*Tritonia challengeriana* *Tritonia vorax*	*Tritonia challengeriana* *Tritonia vorax* *Marionia*		*Marionia*	*Tritonia*
Dotidae		*Doto*		*Doto*	*Doto*
Phylliroidae		*Phylliroe bucephala*			*Phylliroe bucephala*
Arminidae		*Armina*	*Armina*	*Armina* *Dermatobranchus pulcherrimus*	*Armina* *Dermatobranchus pulcherrimus*
Discodorididae		*Geitodoris* *Rostanga*	*Geitodoris* *Rostanga muscula*	*Rostanga muscula*	*Geitodoris* *Rostanga muscula*

Family	Antarctic Region	Magellanic Region	South Africa	Australia	New Zealand
Zephrynidae			*Janolus*	*Janolus hyalinus* *Caldukia*	*Janolus hyalinus* *Caldukia*
Flabellinidae	*Flabellina falklandica*	*Flabellina falklandica*	*Flabellina*	*Flabellina* *Tularia*	*Flabellina* *Tularia*
Eubranchidae		*Eubranchus agrius*	*Eubranchus*		*Eubranchus agrius*
Aeolidiidae		*Spurilla*		*Aeolidiella*	*Spurilla* *Aeolidiella*
Tergepedidae	*Cuthona georgiana*	*Cuthona georgiana*	*Cuthona*	*Cuthona*	*Cuthona*
Facelinidae		*Phidiana*	*Phyllodesmium serratum*	*Phidiana* *Phyllodesmium serratum*	*Phidiana*
Fionidae				*Fiona pinnata*	*Fiona pinnata*
Onchidiidae		*Onchidella*		*Onchidella patelloides*	*Onchidella patelloides*
Siphonariidae	*Kerguelenella lateralis*	*Kerguelenella lateralis*			*Kerguelenella*
Ellobiidae		*Marinula*		*Marinula* *Ophicardelus*	*Marinula* *Ophicardelus*
Nuculidae	*Pronucula.* *Ennucula*	*Ennucula*	*Pronucula*	*Pronucula*	*Pronucula*
Nuculanidae	*Yoldiella valletei*	*Yoldiella valletei*		*Jupiteria* *Poroleda* *Propoleda* (? Siliculidae)	*Yoldiella* *Jupiteria* *Poroleda*
Neilonellidae				*Pseudotindaria*	*Pseudotindaria*
Tindariidae		*Tindaria*			*Tindaria*
Solemyidae		*Acharax*			*Acharax*
Siliculidae	*Propeleda longicaudata* *Silicula*	*Propeleda longicaudata* *Silicula*			
Mytilidae	*Aulacomya ater* *Dacrydium*	*Aulacomya ater* *Choromytilus* *Dacrydium*	*Aulacomya ater* *Choromytilus*	*Modiolus areolatus* *Adipicola* *Dacrydium* *Trichomusculus barbatus* *Xenostrobus pulex*	*Aulacomya* *Adipicola* *Trichomusculus barbatus* *Modiolus areolatus* *Xenostrobus pulex* *Dacrydium*
Arcidae	*Bathyarca*	*Bathyarca*		*Bathyarca*	*Bathyarca*
Limopsidae	*Limopsis hirtella* *Limopsis knudseni* *Limopsis marionensis*	*Limopsis hirtella* *Limopsis knudseni* *Limopsis marionensis*		*Limopsis* *Pectunculina*	*Pectunculina*
Philobryidae	*Philobrya capillata* *Philobrya olstadi* *Philobrya sublaevis* *Philobrya wandelensis* *Lissarca notocadensis* *Lissarca miliaris* *Verticipronus*	*Philobrya capillata* *Philobrya olstadi* *Philobrya sublaevis* *Philobrya wandelensis* *Lissarca notocadensis* *Lissarca miliaris*		*Lissarca* *Philobrya*	*Lissarca* *Philobrya* *Verticipronus*
Limidae	*Limatula hodgsoni* *Limatula pygmea* *Escalima*	*Acesta* *Limatula hodgsoni* *Limatula pygmea*		*Acesta* *Divarilima sydneyensis* *Limaria orientalis* *Limatula*	*Acesta* *Divarilima sydneyensis* *Escalima* *Limaria orientalis* *Limatula*
Ostreidae		*Ostrea chilensis*			*Ostrea chilensis*
Pectinidae	*Psychrochlamys patagonica* *Cyclopecten* *Hyalopecten* *Propeamussium meridionale*	*Psychrochlamys patagonica* *Cyclopecten*	*Cyclopecten*	*Psychrochlamys delicatula* *Mesopeplum convexum* (introduced) *Cyclopecten kapalae*	*Psychrochlamys delicatula* *Propeamussium meridionale* *Mesopeplum convexum* *Cyclopecten kapalae* *Hyalopecten*

Family	Antarctic Region	Magellanic Region	South Africa	Australia	New Zealand
Anomiidae				*Anomia trigonopsis*	*Anomia trigonopsis*
Lucinidae	*Lucinoma lamellata*	*Lucinoma lamellata* *Epicodakia*		*Epicodakia*	*Lucinoma* *Epicodakia*
Thyasiridae	*Genaxinus bongraini* *Genaxinus debilis* *Thyasira falklandica*	*Genaxinus bongraini* *Genaxinus debilis* *Thyasira falklandica*		*Genaxinus* *Parathyasira*	*Genaxinus* *Parathyasira*
Lasaeidae	*Lasaea consanguinea*	*Lasaea consanguinea*		*Lasaea* *Arthritica* *Myllita* *Borniola* *Melliteryx*	*Lasaea* *Arthritica* *Myllita* *Borniola* *Melliteryx*
Kellidae	*Kellia simulans*	*Kellia simulans*			
Montacutidae	*Mysella charcoti* *Mysella miniscula* *Scioberetia australis*	*Mysella charcoti* *Mysella miniscula* *Scioberetia australis*		*Mysella*	*Mysella*
Cyamiidae	*Cyamium* *Cyamicardium denticulatum* *Cyamicardium crassilabrum* *Cyamiomactra laminifera* *Perrierina*	*Cyamium* *Cyamiocardium denticulatum* *Cyamicardium crassilabrum* *Cyamiomactra laminifera*		*Cyamiomactra* *Perrierina*	*Cyamiomactra* *Perrierina*
Neoleptonidae	*Neolepton umbonatum*	*Neolepton umbonatum*		*Neolepton*	*Neolepton*
Sportellidae				*Anisodonta*	*Anisodonta*
Carditidae	*Carditella* *Cyclocardia astartoides*	*Carditella* *Cyclocardia astartoides*	*Carditella*	*Carditella* *Cyclocardia*	*Carditella*
Condylocardiidae				*Benthocardiella* *Hamacuna* *Condylocardia* *Condylocuna* *Volupicuna*	*Benthocardiella* *Hamacuna* *Condylocardia* *Condylocuna* *Volupicuna*
Crassatellidae				*Talabrica*	*Talabrica*
Astartidae	*Astarte longirostris*	*Astarte longirostris*			
Cardiidae				*Pratulum*	*Pratulum*
Tellinidae				*Macomona* *Pseudarcopagia*	*Macomona* *Pseudarcopagia*
Gaimardiidae	*Gaimardia trapesina* *Kidderia bicolor* *Kidderia pulsilla* *Kidderia exilis*	*Gaimardia trapesina* *Kidderia bicolor* *Kidderia pulsilla* *Kidderia exilis*		*Gaimardia*	*Gaimardia trapesina* (different s.s.)
Veneridae	*Tawera*	*Tawera* *Protothaca*	*Eumarcia* *Sunnetta contempta*	*Tawera spissa* (introduced from NZ) *Bassina* *Notocallista* *Ruditapes largillierti* (introduced from NZ) *Eumarcia* *Sunnetta contempta*	*Tawera spissa* *Bassina* *Notocallista* *Ruditapes largillierti* *Protothaca*
Hiatellidae	*Hiatella arctica* *Hiatella solida*	*Hiatella arctica* *Hiatella solida* *Panopea*	*Hiatella arctica*	*Panopea* *Hiatella*	*Hiatella arctica* *Panopea*
Pholadidae		*Xylophaga*		*Xylophaga*	*Xylophaga*
Teredinidae		*Bankia*		*Bankia australis* *Lyrodus pedicellatus* *Nototeredo edax*	*Bankia australis* *Lyrodus pedicellatus* *Nototeredo edax*

Family	Antarctic Region	Magellanic Region	South Africa	Australia	New Zealand
Parilimyidae				*Parilimya*	*Parilimya*
Thraciidae	*Thracia meridionalis*	*Thracia meridionalis*			*Thracia meridionalis*
Periplomatidae				*Offadesma angasi* *Pendaloma micans*	*Offadesma angasi* *Pendaloma micans*
Clavagellidae			*Clavagella australis*	*Clavagella australis*	
Lyonsiidae	*Lyonsia arcaeformis*	*Lyonsia arcaeformis*			
Myochamidae				*Myochama tasmanica* *Myadora antipodum*	*Myochama tasmanica* *Myadora antipodum*
Verticordiidae				*Spinosipella ericia* *Halirus*	*Spinosipella ericia* *Halirus*
Cleidothaeridae				*Cleidothaerus albidus*	*Cleidothaerus albidus*
Lyonsiellidae	*Lyonsiella*	*Lyonsiella*		*Lyonsiella*	*Lyonsiella*
Poromyidae	*Poromya adelaidis*	*Poromya adelaidis*		*Poromya undosa*	*Poromya undosa*
Cuspidariidae	*Cuspidaria infelix* *Cuspidaria tenella* *Subcuspidaria kerguelensis*	*Cuspidaria infelix* *Cuspidaria tenella* *Subcuspidaria kerguelensis*		*Plectodon* *Pseudoneaera* *Rhinoclama*	*Plectodon* *Pseudoneaera* *Rhinoclama*
Lepidopleuridae	*Leptochiton kerguelensis*	*Leptochiton kerguelensis*		*Leptochiton*	*Leptochiton*
Hanleyidae	*Hemiarthrum setulosum*	*Hemiarthrum setulosum*			
Ischnochitonidae	*Callochiton bouveti* *Callochiton gaussi* *Nutallochiton hyadesi* *Nutallochiton mirandus*	*Callochiton bouveti* *Callochiton gaussi* *Nutallochiton hyadesi* *Nutallochiton mirandus* *Chaetopleura*	*Chaetopleura* *Lepidozona* *Callochiton*	*Callochiton crocinus* *Lepidozona* *Eudoxochiton*	*Callochiton crocinus* *Lepidozona* *Eudoxochiton*
Schizochitonidae				*Loricella profundior*	*Loricella profundior*
Mopaliidae	*Plaxiphora aurata*				*Plaxiphora aurata*
Chitonidae				*Chiton glaucus* *Sypharochiton pelliserpentis* (introduced)	*Chiton glaucus* *Sypharochiton pelliserpentis*
Dentaliidae	*Fissidentalium majorinum*	*Fissidentalium majorinum*		*Fissidentalium*	*Fissidentalium*
Gadilidae	*Cadulus dalli* *Siphonodentalium*	*Cadulus dalli*	*Cadulus*	*Cadulus*	*Cadulus* *Siphonodentalium*
Sepiadariidae				*Sepioloidea pacifica*	*Sepioloidea pacifica*
Sepiolidae			*Iridoteuthis*	*Iridoteuthis*	
Loliginidae				*Sepioteuthis australis*	*Sepioteuthis australis*
Lycoteuthididae				*Lycoteuthis lorigera*	*Lycoteuthis lorigera*
Enoploteuthididae				*Enoploteuthis galaxias*	*Enoploteuthis galaxias*
Pyroteuthididae		*Pterygioteuthis*		*Pterygioteuthis gemmata* *Pyroteuthis margaritifera*	*Pterygioteuthis gemmata* *Pyroteuthis margaritifera*
Octopoteuthidae		*Taningia danae*		*Taningia danae*	*Taningia danae*
Onychoteuthidae	*Kondakia*	*Kondakia* *Onychoteuthis banksii* *Moroteuthis ingens*		*Moroteuthis* *Onychoteuthis*	*Onychoteuthis banksii* *Moroteuthis ingens*

Family	Antarctic Region	Magellanic Region	South Africa	Australia	New Zealand
Gonatidae		*Gonatus antarcticus*			*Gonatus antarcticus*
Architeuthididae		*Architeuthis*		*Architeuthis*	*Architeuthis*
Histioteuthididae		*Histioteuthis atlantica*	*Histioteuthis atlantica* *Histioteuthis miranda*	*Histioteuthis atlantica* *Histioteuthis macrohista*	*Histioteuthis atlantica* *Histioteuthis miranda* *Histioteuthis macrohista*
Ommastrephidae	*Martialia hyadesi*	*Martialia hyadesi* *Todarodes filippovae*		*Todarodes* *Notodarus gouldi*	*Martialia hyadesi* *Todarodes filippovae*
Chiroteuthididae		*Chiroteuthis*	*Chiroteuthis*	*Chiroteuthis*	*Chiroteuthis*
Mastigoteuthidae				*Mastigoteuthis*	*Mastigoteuthis*
Cranchiidae		*Galiteuthis*		*Leachia* *Cranchia scabra* *Teuthowenia pellucida*	*Leachia* *Cranchia scabra* *Teuthowenia pellucida* *Galiteuthis*
Vampyroteuthidae			*Vampyroteuthis infernalis*	*Vampyroteuthis infernalis*	*Vampyroteuthis infernalis*
Opisthoteuthididae				*Opisthoteuthis*	*Opisthoteuthis*
Amphitretidae				*Amphitretus*	*Amphitretus*
Vitreledonellidae				*Vitreledonella richardi*	*Vitreledonella richardi*
Octopodidae	*Graneledone* *Thaumeledone* *Parledone* *Benthoctopus*	*Parledone* *Benthoctopus*		*Octopus warringa* (= *huttoni*) *Pinnoctopus maorum* (= *cordiformis*)	*Octopus huttoni* *Pinnoctopus cordiformis* *Parledone* *Benthoctopus* *Graneledone* *Thaumeledone*
Tremoctopodidae				*Tremoctopus violaceus* (= *robsonianus*)	*Tremoctopus robsonianus*
Ocythoidae		*Ocythoe tuberculata*		*Ocythoe tuberculata*	*Ocythoe tuberculata*
Argonautidae			*Argonauta nodosa*	*Argonauta nodosa*	*Argonauta nodosa*

COLLECTING ROCK BORERS IN NEW ZEALAND

By A.G. Stevenson

[Reprinted, without change, from *Mollusca* (Tavares), Volume 1, Number 9, 1 June 1946.]

"Auckland, New Zealand, is rather favorably situated from the shell-collector's point of view. It stands at the base of the very large Hauraki Gulf and the irregular coastline, sandy bays and rocky points offer almost every type of collecting ground. The rocks, too, are of different kinds, in different places, so that suitable habitats are provided for a very large variety of molluscs.At one of our suburbs, called Narrow Neck on account of its geographical peculiarity, there are extensive beds of sandstone. These tilt upward toward the sea and the result is that they form a series of shelves roughly parallel with the shore. These shelves are ideal homes for the Rock Borers and quite a few kinds can be obtained without much hard work. The main thing is to pick a good low tide and then proceed to break away the overhanging shelves with a hammer and cold-chisel. Of course there are many breakages, but with care and patience a good collection can be made during the one low tide. The rock is quite soft and breaks up easily, the main drawback being the strain on your back by the continual stooping. Commonest of all is the little Date Mussel, *Zelithophaga truncata*, a shiny little brown fellow which grows up to about an inch and three quarters in length. There are plenty of these and we usually just pick up the best ones while looking for other less common borers. *Anchomasa similis*, which is very like your *Zirfaca*, but more pleasingly proportioned, grows to a good size here and specimens three inches long are quite common. It is a very fine shell, snow white in color. Then there are two species of *Pholadidea*. *P. spathulata* grows up to about two and a half inches in length and is quite common. *P. tridens* is quite a lot smaller and is distinguished by its shelly posterior cup. The anterior globose end is very thin and many fine specimens are spoiled in the process of extracting them from their burrows. This exhausts the list of borers proper but in the old burrows we find *Notirus reflexa*, one of the Venerids, often with a much distorted shell. Also in these burrows, sometimes inside dead *Notirus* shells, we find the rather globular glossy *Kellya suborbicularis*. With a good low tide and plenty of perserverence we can usually expect to leave the reef with representatives of all six of these species, plus a sore back."

[I can't help wondering how much erosion to the Narrow Neck sandstone shelves since 1946 has been due to a generation of enthusiastic shell-collectors (in spite of sore backs) wielding their hammers and cold-chisels! Hopefully, nowadays, we've become rather more caring for such habitats. – Ed.]

'LET HIM NAME IT WHO CAN'

By Jill Burnet

I was leafing through an anthology one day, when a poem entitled "The Shell" caught my eye, and, in particular, one verse –

"What is it? A learned man
Could give a clumsy name.
Let him name it who can
The beauty would be the same."

I am sure that many shell collectors find themselves in agreement with this sentiment, especially when the 'learned men' keep changing the clumsy names. You can thank, or blame, the great Swedish naturalist, Carl von Linné, for our present system of naming shells. In the century before Tennyson wrote his poetry, Linné established the binomial system of nomenclature – prior to this, no one convenient system was in widespread use. 'Binomial' means having two names or terms, from 'bi-', a prefix indicating two, as in binary, bicycle, and 'nomen', meaning name, from which words such as nomenclature, nominate, and nominal are derived. Each species is identified by a genus (generic) name, which is a noun, and a species (specific) name which is usually an adjective, both being in Latin, or something masquerading as Latin. At that time, Latin was learned by educated men throughout Europe. Latin is a highly inflected language, which means that the suffixes, or endings, of words change according to their use in a sentence. An adjective agrees with its noun, which is why the ending of a species name sometimes changes when the genus name is changed. However, if a new form is named after a person or a place, a noun may be used for the species name or as a genus name. When this happens, the specific name will be in the possessive case – such as the shell of so and so. Linné even latinised his own name to Carolus Linnaeus, and this form is used just as much as Linné. This binomial system doesn't apply just to shells, but to animals and plants – when I look through my herb books, I see L. for Linné as often as in my shell books. Luckily, for Linné, many of the species of flora and fauna that we know today hadn't been discovered then, but it still must have been a massive undertaking. The starting point for the naming of animals and plants is officially recognised by the date of publication, 1st January 1758, of the 10th Edition of his catalogue, the *Systema Naturae*. These volumes set the scene, but nowadays the procedure for naming new kinds of animals has to follow strict rules known as the *International Code of Zoological Nomenclature.*

If you find yourself in the fortunate position of describing a new species, you will have to think up a name for it, and turn it into something resembling Latin. A common specific name in this country is, of course, New Zealand, in various latinised forms – *novaezelandiae*, 'novus' being the Latin for new, giving us such English words as novel, novelty, novice, or *neozelanica*, from the Greek νεος (neos), young, new, as in neophyte, neonatal, and so on. Many shells are named after people whom the author wishes to honour, an eminent scientist or colleague or the collector – perhaps in the hope of having the favour reciprocated. In a recent *Cookia*, Elliot Dawson has listed shells named for Dr Dick Dell, and he delved also into the background of *Myllita stowei* and discovered how that species had been named after Edwin Stowe, probably the first conchologist at the old Colonial Museum – so don't go trying to find the meaning of '*Dickdellia*' or '*stowei*' in your Latin dictionary. However, many names are, in fact, Latin or Greek words which describe some feature of the shell, and some names are taken directly from Greek or Roman mythology, such as Argonauta. I have already rambled on about the derivation of *Argonauta argo*; the other argonaut which you might find is *nodosa* but you don't need a dictionary for that – the meaning of 'nodosus' in the Latin dictionary is 'knotty, full of knots or knobs', and the Oxford English Dictionary gives exactly the same meaning for 'nodose'. Unlike the names of shells, some things just don't change.

MARINE MOLLUSCA – NGAMOTU BEACH, NEW PLYMOUTH

By Jim Harding

New Plymouth area has several beaches from which one can collect shells. These beaches can start from the beach at the mouth of the Waitara River; then there is Bell Block beach which is best at low tide when the rocks are exposed: closer in to the city one can look at the beach at Fitzroy which is also best at low tide on account of the rock situation.

Next, also a low water collecting time is the reef, known as Kawaroa reef., which runs out to sea in front of the Aquatic centre. The rocks can be interesting and they run from the reef around to the sea wall at the boat harbour. The next beach is Ngamotu, next to the Port of New Plymouth This is a sandy beach - there is only a patch of rocks at the Eastern end at very low tide and a few large rocks at the centre. A small stormwater stream runs out at the same spot. Next comes the Back Beach which is on the other side of Paritutu Rock. It consists of stones up along the high water mark - at low water there is a long sandy beach. The next beach along is Oakura and the western side is a beach that is reached by going down Lower Pitone Rd. This beach has potential.

The list I have compiled is only what I have found myself, and is only from one beach which is Ngamotu Beach. My collecting visits are very regular - every morning Monday to Friday on my walk home from city centre where I am dropped off at 7.00am, so I have lots of time on the beach. I find the best collecting is at very low tides.

When I first shifted to New Plymouth from a good shelling area such as Nelson, I was asked why am I going to New Plymouth - there are no shells to be found around Taranaki ! I have now lived here 15 months and my list of different species has grown to over 90. A lot of specimens that I find are damaged. However, I have also found some very good quality shells, rare and hard to find. Ngamotu Beach produces a lot of limpets and very good unworn specimens. I find the Slit Limpet (*Emarginula striata*) regularly, sometimes up to four in one trip. Also found are some very colourful specimens of *Cellana stellifera* . I like to pick up the ones which are encrusted over with a limey coat as once it is cleaned off in most cases it is a nice specimen and not at all worn.

Some of the specimens that are not easy to find elsewhere that I have picked up are *Haliotis virginea australis, H. virginea virginea* along with possible subspecies, *Rexithaerus spenceri,* good double valves, *Calliostoma* (*Maurea*) *tigris, Calliostoma* (*M.*) *pellucidum,* almost black, with a large number of dark brown blotches up to the protoconch, which went up very steeply, *Epitonium* (*A.*) *minorum* [?] which is an almost apricot colour with white edges on the varices and in perfect condition, *Tellinota edgari* pair, *Diplodonta striatula, Gari* (*Psammobia*) *convexa, Leptomya retiara retiara, Trivia* (*Ellatrivia*) *merces,* and *Cabestana spengleri,* which was broken.

The list below is the shells I have collected off Nga Motu Beach, some are damaged, others large portions broken off and others being perfect shells.

BIVALVIA

Solemya (Solemyarina) parkinsonii
Nucula hartvigiana
Barbatia novaezealandiae
Glycymerula modesta
Perna canaliculus
Tellinota edgari
Gari (Gobraeus) stangeri
Gari (Psammobia) lineolata
Gari (Psammobia) convexa
Soletellina nitida

Xenostrobus pulex
Modiolarca impacta
Zelithophaga truncata
Atrina zelandica
Saccostrea glomerata
Talochlamys zelandiae
Diplodonta striatula
Divalucina cumingi
Cardita aoteana
Mactra discors
Scalpomactra scalpellum
Spisula (Crassula) aequilatera
Paphies australis
Paphies subtriangulata
Macomona liliana
Peronaea gaimardi
Pseudoarcopagia disculus
Rexithaerus spenceri
Soletellina siliquens
Leptomya retiaria retiaria
Dosina crebra
Dosina zelandica
Austrovenus stutchburyi
Protothaca crassicosta
Bassina (Callanaitis) yatei
Tawera spissa
Dosinia (Austrodosinia) anus
Dosinia (Phacosoma) subrosea
Irus reflexus
Irus elegans
Nucula nitidula
Ruditapes largillierti
Hiatella arctica
Pholadidea suteri
Anchomasa similis
Myadora striata

GASTROPODA

Cellana ornata
Cellana radians
Cellana stellifera
Patelloida corticata
Haliotis iris
Haliotis virginea virginea
Haliotis virginea australis
Emarginula striatula
Scutus breviculus
Tugali suteri
Diloma (Fractamilla) bicanaliculata
Melagraphia aethiops
Trochus tiaratus
Trochus viridus
Zethalia zelandica
Calliostoma (Maurea) punctulata
Calliostoma (Maurea) pellucidum
Calliostoma (Maurea) tigris
Cookia sulcata
Turbo smaragdus
Zeacumantus lutulentus
Maoricolpus roseus
Serpulorbis zelandicus
Nodilittorina cincta
Nodilittorina antipodum
Nerita (Melanerita) atramentosa
Struthiolaria papulosa
Crepidula monoxyla
Sigapatella novaezelandiae
Sigapatella tenuis
Tanea zelandica
Epitonium (Acutiscala) minora
Janthina janthina
Janthina exigua
Dicathais orbita
Haustrum haustorium
Lepsiella scobina
Trivia (Ellatrivia) merces
Austrofusus chathamensis
Buccinulum linea
Cominella maculosa
Cominella adspersa
Penion sulcatus
Cabestana spengleri
Semicassis pyrum
Siphonaria australis
Haminoea zelandiae

POLYPLACOPHORA
Amaurochiton glaucus and *Eudoxochiton nobilis*
CEPHALOPODA *Spirula spirula*

THE CHARM OF SOUTH AFRICAN SHELLS – A SHORT EXCURSION IN THE SOUTHERN CAPE

By Zvi Orlin

The charm of South Africa for me, was not only limited to its shells: it was the country of my education and youth, filled with pleasant memories of colorful, superb scenery – veld, mountains, deserts, a sub-tropical coast and the charming Cape Province, with its unique flora and fauna. It also has an intermingling of tribes and later European settlers, with the resulting inequalities and internecine altercations, as are also found in other regions of the African continent. But during my last visit 11 years before, I was regrettably not yet an amateur conchologist. So it was with great expectations and excitement, that I set out once more to visit my aging brother, and to spend a week searching the shores for shells.

The great attraction of South Africa for shellers is, of course, it being the base of a collision of 2 mighty ocean currents – the warm Mozambique-Agulhas current in the Indian Ocean, from equatorial waters, and the cold Benguela current in the Atlantic Ocean, surging north from the floating ice of Antarctica, with its upwelling and nutrient rich flow. This meeting place of the two oceans has a wealth of endemic species of marine molluscs, estimated as 52% in a recent article in the *South African Journal of Science*, compiled by M.J.Gibbon and a group of scientists. Few countries in the world can compete with this level. This article published in January 1999, mentions 3062 species found on South Africa's shores, of which a full list has not yet been published, but it probably is continuously being supplemented by additional new finds, and hopefully we will benefit by this information in the near future.

My first call was to Professor Douw Steyn in Pretoria, who together with Markus Lussi, published a well illustrated book on marine shells of South Africa, describing over 1000 species, mostly beach collected. We made an exchange of shells. He and his wife Elise have a fine collection, and they were most generous in providing me with very fine specimens, of many interesting species of some of the South African families (worthy of note is that over 220 species from our Red Sea region are also found in South Africa, on the Indian Ocean side, and are dealt with in their book.) He also gave me the addresses of some renowned amateur conchologists in Cape Town, which I was due to visit, and suggested some of the most likely beaches to search for shells.

When we arrived in Cape Town I met David Freeman, one of the leading figures among shell collectors in the Cape for many decades, who was very friendly and also generous. He took me to visit Victor Millard, whose book *Classification of Mollusca* (of which I have a copy), is an updated version of Kay Vaught's famous older version, which was my 'Bible' for many years. Both David and Victor presented me with some local shells, and gave me good advice which beaches were most prolific. Regrettably, David passed away shortly after my visit. Victor gave me the address of his friend Arie Jooste of Aston Bay, of whom I will write more later.

I concentrated on five main regions: the first was Sea Point in Cape Town on Table Bay, where I collected 36 species. Of special note from this location were 6 species of *Patella*, of unusual forms and colors (over 20 *Patella* species are found in S.Africa, and many of them are endemic). Additional finds were a few Trochidae, which are common, of the genus *Diloma* mainly found in the Cape (its subgenus *Oxystele* has recently been upgraded to genus level, but some experts still use it as a subgenus). Three 3 species of *Diloma* are also found in New Zealand, but not in Australia. I also collected some fine, large specimens of Mytilidae: *Choromytilus meridionalis* and *Aulacomya ater*, mainly found in the southern and western Cape. A subspecies of *Aulacomya* is found in New Zealand, but not in Australia. One wonders if this is purely incidental? Perhaps

we should not be surprised, and remember that during the Ordovician Period, in the Gondwana supercontinent, they were both near the Equator, and the distance between the southern tips of what are Africa and New Zealand, nowadays, were much closer than currently, and they were separated by a relatively shorter distance of open ocean, whereas Australia was much further away. This may have contributed to the appearance of similar species or genera currently.

The second location I searched was Seaforth, further south on the Cape Peninsula, where I found my first *Bullia* species (these large unusual Nassaridae, common in South Africa, are mainly found along the S.E. and E. coasts). This was where I also found my first **Marginella** – *M. rosea*, an endemic species of the S.W.Cape. South Africa is famous for its species of *Marginella*, almost all of which are endemic, and they are very popular with collectors, some being very highly priced. Here I also found my first Cone – *Conus algoensis*, endemic to the S.W.Cape. We then visited a nearby beach called Boulders, where a thriving penguin colony is in residence. They are quite tame, and on the large boulders one can get to within touching distance from them, without them batting an eyelid. It was one of the highlights of our trip!! Fantastic!!! Both these locations are on the eastern side of the peninsula with warmer sea temperatures, in contrast to Sea Point on the colder west coast.

We then detoured to the famous Kirstenbosch Gardens, at the foot of Table Mountain, which houses most of the endemic species of the flora of the Cape. During a brief stroll along the innumerable paths, we met up with a large family of mongooses, frolicking among the bushes, who seemed oblivious to our presence, but to us it was like a gala performance.

At last we set out on a four-day journey along the Garden Route, which is so well renowned to all tourists who come to South Africa, and is situated on the Indian Ocean side of the continent. It was February – mid-summer, ideal dry weather, as this is part of the Mediterranean Climatic Region, with winter rains. We set out from Cape Town on an easterly route, via Sir Lowries Pass in the Hottentot-Holland mountains, to Mossel Bay. This is the beginning of the Garden Route, heading east along the coast through George, and, just before Knysna, we made our first stop at Breton-on-Sea. The cliff top afforded a splendid view of the Knysna Lagoon. At the crack of dawn, I hiked down to the sandy rock-strewn beach, and competing with the local Oystercatchers (*Haematopus moquini*), which were feeding on the bivalves, only found 14 species of shells. They were mainly bivalves – among them some fine large specimens of the endemic *Donax serra*, *Perna perna* (also found in our Red Sea), the uncommon *Saccostrea forskahlii*, and *Limaria tuberculata*, which is a nest building species, also found on our Mediterranian shores and known in Europe as *Limaria inflata*.

Our next stop was Plettenberg Bay. Here a relation of ours, had been spending her summer vacations for a few decades, and had accumulated a collection of beached shells for aesthetic appreciation. She is an artist, and was enamoured with the beauty of the shells, all found locally. She offered me the choice of any of her specimens, so I acquired over 30 species, half of which were new to my collection. I would have needed a much more extended stay to have found them. While drinking coffee on her porch overlooking the sea, we were entertained by a large pod of dolphins, a hundred or more, diving into the waves just offshore, from east to west and back again – as though a special repeat performance for our entertainment and joy – an unbelievable sight! (the only place I have seen a larger pod, was once in the Galapagos Islands, where the sea all around our boat was covered by uncountable hundreds of diving dolphins, whom we joined in the water to get a closer look – only seeing is believing!)

We couldn't leave the area without a short hike in the famous Tsitsikama Forest, and a boat trip through the Storms River Canyon, dwarfed by the giant trees and cliffs, which are one of the most beautiful sites of Southern Africa. Trees here reach a height of over 30m, some are reputed to be

1000 years old, and rare birds can be spotted in the forest. This is the heart of the all year rainfall region of Southern Africa.

We continued to Jeffreys Bay, our last and most important destination, where we spent a few days. It was renowned as one of the most prolific beaches for shells in the S.E. Cape, more than400 species of molluscs have been collected and classified, a veritable shell collector's paradise. As I was there not in the right season, (winter is recommended), I realized that I could not expect to find too many shells. I collected 40 species, some which were also found in other former locations. Of special interest were many endemic species of which I found fine specimens: *Turbo sarmaticus*, *Turbo cidaris*, *Calyptraea helicoidea*, *Burnupena cincta*, *Burnupena pubescens*, *Bullia tenuis*, *Trigonostoma foveolata*, *Conus natalis*, *Glycymeris connollyi*, *Ostrea algoensis*, *Ostrea atherstonei*, and two large specimens of S.Africa's largest chiton: *Dinoplax gigas*. I later established contact with a local shell collector, who has been scouring the beaches for many years. We exchanged shells and I received from him another 50 species from Jeffreys Bay. I also visited the local Shell Museum, which has an impressive display of Jeffreys Bay and other shells.

But the biggest bonus of all, was meeting Arie Jooste, with his fascinating collection of shells of the region. He and his son Philip have found some of the rarest shells and some species were named after him. He was very friendly and generous, and gave me many specimens for my collection.

We concluded our trip in Port Elizabeth, and as we were flying back north, I summed up: I set out on my trip with only a few dozen shells of South Africa in my collection, and was returning with a wealth of additional species, comprising a few hundred. (After a few later exchanges, I reached 700species, including shells from other locations which are also found in SouthAfrica). I had concluded my short southern sojourn, to one of the finest corners of the globe, not only for charming shells, but also for charming people and not less charming scenery, which I strongly recommend deserve a visit, my dear colleagues.

REFERENCES

DOUW, G. STEYN; LUSSI, M. 1998: *Marine Shells of South Africa*. Hartbeespoort, South Africa: Ekogilde. 264p.

DOUW, G.; STEYN, E.J. 1999: *The Sea Shells of Jeffreys Bay*. Hartbeespoort, South Africa: Ekogilde. 89p.

GIBBONS, M.J. *et al.* 1999: The Taxonomic richness of South Africa's marine fauna: a crisis at hand. *South African Journal of Science* 95: 8-12

RICHARDS, D. 1981: *South African Shells A Collector's Guide*. Cape Town: C.Struik (Pty) Ltd, 158p.

⌘ ⌘ ⌘

'LOCATION – LOCATION – LOCATION'

By Jill Burnet

I have just found a *Xenophalium pyrum* – only it's called *Semicassis pyrum* now. However, when I saw it, being behind the times, I thought - "*Xenophalium pyrum*". Then I thought – "What's it doing there? That's a strange place for a shell." It is of medium size, with reasonable markings, it spire in very good condition, still with wet sand clinging to it. So far – nothing to write home about, let alone even to *Cookia*. But, I found this shell in a new location, and not just a new location for this species, but a new location for any shell, a location not even mentioned in Jenny Raven's comprehensive Wellington Shell Lists of *Cookia* Volume 14. And it is such a convenient location, easy to find, close to my home, on my route to shops and city, simply couldn't be better

The shell was lying in the gutter in Elizabeth Street, in the highly-desirable and up-market suburb of Mount Victoria when I happen to live. Now, although the best properties in Mount Victoria have harbour views, we are not really all that close to the sea, certainly not so close that a shell could get there of its own accord. So which member of our shell club has been wandering around my neighbourhood, planting shells for me?

And, whereas any shell is better than none, what about leaving something rare or more exciting next time, something that I don't already have in my collection, perhaps even something that Jenny Raven doesn't have? Is that too much to ask? I'll be looking out for it, every time I walk down Elizabeth Street.

THE "YUK" METHOD OF CLEANING SHELLS

By Eddie Torr

There have been several articles in *Cookia* and much talk at Club meetings about how to clean shells. Most of us have found gastropod shells with their contained fleshy animal still present rather hard to deal with. It's often well-nigh impossible to get the last bit of smelly tissue right out. I can't recall anyone talking about having the used what I'll have to call the "yuk" method –because it's not very pleasant even if it does achieve good results eventually.

In a note in *The Nautilus* Vol. 54, No. 4, of April 1941, Walter J. Eyerdam relates how he once worked in a herring saltery in Alaska where "thousands of tons of herring meal was prepared. Often, when some of the sacks of meal were not properly dried or became damp, they attracted blow-flies which soon produced teeming masses of maggots."

As a result of this experience he devised the following method for cleaning a very large number of *Thais lamellosa* which he had collected during the Summer of 1940 while working in the herring fishery at Thum Bay, Knight Island, Alaska.

"About a gallon of *Thais* and other mollusks were brought to a boil in a pail of water and left to stand for a week or more until slightly putrid, then the water was thrown away and about a pint of maggots put into the pail, or box, with the shells. In a week or ten days the shells were all washed and found to be cleaner than a whistle. A bath in a weak solution of chlorox for several hours was then sufficient to make a clean, attractive specimen of each shell.

"Of the many methods used for cleaning shells that are difficult to extract, I have found the above method of recruiting the repulsive maggots to do the work has been the most efficient."

THE OPERCULUM

By Anne Gray Hackney

[This article originally appeared in *Mollusca*, a short-lived shell magazine privately published by Paul H. Reed of Tavares, Florida, USA. from September 1944 to August 1949. Several articles of New Zealand interest appeared in it, including 'Collecting Rock Borers in New Zealand' by A.G. Stevenson, and 'Collecting Paryphanatas in New Zealand during1938' by Arthur Richardson. Hopefully, reading the present article will alert shell collectors to the interest and importance of opercula rather than odd bits not worth saving ...]

"The operculum is the trapdoor or lid with which the greater majority of prosobranchiate gastropods close the aperture of their shell, when in danger, or while resting. It fits the aperture tightly in some genera (*Busycon*, *Strombus*); is occasionally rudimentary (*Sinum*) and sometimes entirely absent (*Acmaea*, *Crepidula*, *Oliva*). Those mollusks possessing it are operculate; the others, inoperculate. The Pulmonata, both land and fresh-water, are without it except in rare instances. The terrestrial snails construct a parchment-like epiphragm over the mouth of their shell while hibernating, but this is not analogous to the operculum. It is constructed of a secretion from the foot; is destroyed or rebuilt at will and is not attached to the animal.

"Opercula are usually composed of a tough, horny substance, which may be thin and translucent, or quite heavy, and thickened on the inner surface. Less often, they are calcareous, like the shell itself. Some of these shelly ones are most beautiful; often tinted with green or brown and with the inside intricately moulded, in some genera. *Turbo petholatus* L. (Cat's-eye), of the South Pacific, is so lovely and unusual, that it has been used for jewelry. It is also considered a lucky piece by sailors who have sailed those once-romantic seas.

"When present, the operculum is situated at the posterior end of the strong muscle by which the animal is fastened to the columella of the shell. When the mollusk is extended, the operculum lies on the animal's back, under the spire of the shell. When the columellar muscle is contracted and the animal withdraws into the shell, the operculum is drawn into place in the aperture. A muscle scar, on the inner surface, marks the place of attachment.

"It is formed in the egg, along with the animal and the shell, and growth proceeds from this nucleus into a number of different forms, depending on the genus or species to which it belongs. Growth lines are present, as in the shell.

"It is of value in classification and experienced colletors save the operculum and replace it in the aperture with a plug of cotton. This shows, too, that the shell was taken alive, which always enhances its worth. If more than one living specimen has been collected, it is well worth to replace one operculum "inside out," so that both sides may be seen and studied.

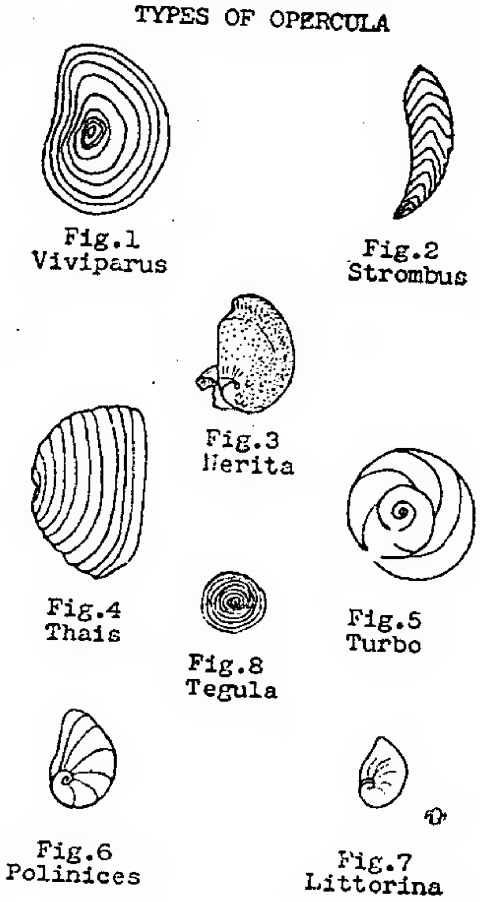
"There are several different forms:

"1. Concentric. Growth proceeds evenly around the nucleus, which is either in a central or sub-central position. *Viviparus*. Fig. 1.
2. Unguiculate or claw-shaped. The nucleus is apical and growth proceeds upward and terminates in a "claw". *Strombus*. Fig. 2.
3. Articulate. Projections on the operculum fit into corresponding teeth in the aperture. *Nerita*. Fig. 3.

4. Excentric. The nucleus is in the center of the columellar side, and growth proceeds out from this, on one side only. *Thais*. Fig. 4.
5. Spiral. (Figs 5, 6, 7, 8). Growth proceeds by revolving around the nucleus, like the gastropod shell, but on a plane (though sometimes it is slightly concave, and may be convex on the inner surface of the calcareous ones). It grows to fit the aperture and is not necessarily controlled by the number of whorls made by the shell. In other words, its growth is independent of that of the shell. Strangely, in dextral shells, the operculum is almost invariably sinistral, and vice versa. Multispiral, subspiral and paucispiral opercula are modifications of this form.

"When accidentally broken, the animal mends it in exactly the same manner in which it repairs a broken shell; material is added to replace that which has been destroyed, but as with the shell, the result is noticeable and imperfect. Mishaps seem seldom to happen, however, due to the unusually tough, horny structure and to its protected position.

"It is a little trouble to save and mount the operculum, but it is worthwhile, for it is almost as interesting to study as the shell, and doing so will add much to the value of the collection."



Reprinted, without change, from *Mollusca* (Tavares) 1 (8): 117-118; 25 February 1946.

WHANGAMATA AND OTHER COROMANDEL BEACHES

By Jim Harding

This trip took place over Queen's Birthday weekend, leaving New Plymouth at 7.00am. on the Friday morning after Jeanette had finished her work. The weather prospect did not look all that brilliant with general rain all the way to Pio Pio where we came into a fine sunny day, and that is the way it stayed for the rest of the trip. The first beach we visited was a small bay named Whiritoa just out of Whangamata This beach dipped very steeply down to the water's edge - there were not many shells so we carried on to Whangamata and to the motel we had booked into which is facing the boat harbour and about 150m. from the ocean beach. We decided to have a look for shells along the ocean beach, and we were soon picking the odd shell up, and then the epitoniids, mostly *Cirsotrema zelebori*, and then the odd *Epitonium jukesianum*. My best find was after we passed Hauturu Island. About half way along towards the mouth of the Otahu River, Jeanette stopped to show me things she had picked up and I looked down by her feet and by a bit of seaweed was a nice full *Tenagodus weldi*. This is the first complete specimen that I have found, more epitoniids - and day light was beginning to fade, so it was off to the motel.

Saturday saw us back on the ocean beach to complete unfinished business along the portion that we had not finished, more epitoniids and more of the common shells. Jeanette told me of another couple of beaches further on from Whangamata where they used to pick up shells years ago, so it was back to the car.

First stop was at Onemana beach, and found not much to pick up there, so on to Opoutere beach. We decided to have a cup of coffee before walking over to the beach. I was pleased we did for out of the rushes and mangroves walked a Banded Rail only four metres away, but by the time I managed to get my camera I just had a moment to see its tail disappearing into the rushes again.

The walk over to the beach through pine trees and manuka was pleasant - the beach is long and sandy. There were all sorts of shells and epitoniids once more. *Tawera spissa* were plentiful and alive, also *Xymene ambiguus* alive and becoming common. After a short while I looked back to see Jeanette down on her hands and knees, and that was how she stayed for a couple of hours. It turned out that she was in a patch of *Epitonium jukesianum* which included *E. minora* and *E. bucknilli* (but only one). *Cirsotrema* were also present. I carried on making a list of shells that I saw, and found some large pieces of *Tonna cerevisina*. Sunday, Jeanette and I decided to take a trip to Whitianga, also to visit some beaches along the way. I took photographs of Slipper Island, Shoe Island, the Alderman Islands, and Mayor Island. A visit to Cook's Beach revealed nothing but *Paphies australis* and *Paphies subtriangulata*. Next was a visit to Cook's navigational site, and a view down into Lonely Bay. Then on to Ferry Landing for a look and further on around to Whitianga, and Buffalo beach which turned up only *Paphies australis*.

Our return trip saw us once more on Opoutere beach. However, we headed in the northerly direction this time - lots of shells much the same as the last trip. Monday, we departed from the motel, me with a big grin and with a large *Tonna cerevisina* tucked under my arm. This specimen was given to me by our host whose husband was a fisherman and, seeing as they had a couple of sitting in a large pot in the office, well, it was destined for my collection.

A quick decision was made - and Waihi beach was next on the list before travelling back home to New Plymouth. This visit proved to be an *Cirsotrema zelebori*) collecting venture only with 141 picked up, some with small holes (later thrown out) - this tally was for my notes only. *Cirsotrema*

zelebori were washing up to our feet as we walked along the tidal line. I did note quite a few *Struthiolaria papulosa* but only of small size.

Below is a list of shells we collected or noted. We did not get to going along the full length of the beach as it would have taken too much time. However, on another trip to this beach I would spend much more time.

BIVALVIA

Solemya parkisonii
Barbatia novaezelandiae
Mytilus galloprovincialis
Modiolarca impacta
Crassostrea gigas
Pecten novaezelandiae
Talochlamys zelandiae
Divalucina cumingi
Myllita stowei
Purpurocardia purpurata
Mactra discors
Spisula (Crassula) aequilatera
Paphies australis
Paphies subtriangulata
Macomona liliana
Peronaea gaimardi
Gari (Gobraeus) stangeri
Gari (Psammobia) lineolatea
Soletellina nitida
Soletellina siliquins
Dosina zealandica
Austrovenus stutchburyi
Bassina yatei
Protothaca crassicosta
Tawera spissa
Dosinia anus
Dosinia subrosea
Irus reflexus
Irus elegans
Ruditapes largillierti
Barnea similis
Myadora boltoni
Myadora striata
Pseudarcopagia disculus

GASTROPODA

Cellana ornata
Cellana radians
Cellana stelifera
Patelloida corticata
Atalacmea fragilis
Haliotis iris
Haliotis virginea virginea
Emarginula striata
Tugali elegans
Cantharidus opalus
Diloma (Fractamilla) bicanaliculata
Diloma subrostrata
Melagraphia aethiops
Trochus (Coelotrochus) tiaratus
Trochus (Thorista) viridis
Zethalia zelandica
Calliostoma (Maurea) punctulata
Cookia sulcata
Nerita Melanenerita) atramentosa
Turbo smaragdus
Zeacumantus lutulentus
Zeacumantus subcarinatus
Maoricolpus roseus
Zeacolpus (Stiracolpus) pagoda pagoda
Zeacolpus (Stiracolpus) symmetricus
Semmicassis pyrum
Tenagodus weldi
Pelicaria vermis
Zegalarus tenuis
Crepidula monoxyla
Crepidula costata
Tanea zelandica
Cirsotrema [Boreoscala] zelebori
Epitonium (Hyaloscala) bucknilli
Epitonium (Hyaloscala) jukesianum
Epitonium (Acutispina) minorum
Janthina exigua
Janthina janthina
Xymene ambiguus
Dicathais orbita
Haustrum haustorium
Lepsiella scobina
Austrofusus chathamensis
Buccinulum linea
Cominella adspersa
Cominella maculosa
Penion sulcatus
Amalda (Baryspira) australis
Amalda (Baryspira) depressa
Amalda (Baryspira) mucronata
Amalda (Gracilispira) novaezelandiae
Haminoea zelandiae
Amphibola crenata
Serpulorbis zelandica
Struthiolaria papulosa
Nodilittorina antipodum
Sigapatella novaezelandiae

- *Tonna cerevisina* were large pieces found on the drift line of the previous full tide; *Myadora boltoni* and *Myllita stowei* were found as single valves.

PARYPHANTA – NEW ZEALAND'S LARGEST LAND SNAIL

By Mary Mouat

[Readers may find some curiosity value in this article originally written for the *New Zealand's Woman's Weekly* 16 May 1935 by Mrs Mary Mouat, author of *Whero in the Land of Maui; natural history lessons in story form of New Zealand forest* and sea. Dunedin, 1947. The shell names and other spellings, grammar etc. have not been altered.]

"As regards our New Zealand land mollusca, countless thousands of them haunt the crystal lakes and streams, and penetrate our thickest and darkest forests. Close up under the clouds, at the line of perpetual snow, we find them in numbers or singly. There, too, the large egg-laying land snails hibernate – the *Paryphanta*, one of giants of our species, and one of the largest to be found on earth. I have found this species at an altitude ranging from 2000 to 3000 feet. The subsidence of lofty land masses has, in many instances, brought these mountain snails to comparatively low levels. In North Auckland's sub-tropical lands, one species has been discovered in the kauri forests and named *P. Busbi*, and is known to the Maoris as puparangi.

Another land snail, the *P. traversi*, is also found in the North Island, but it has been brought to ocean level in at least one place – namely, Levin, near Wellington – owing to the subsidence through the ages of the surrounding tablelands and hills. The two varieties of mountain snails under discussion were, until recently, the only ones found in the North Island, but a third has been discovered in the Ruahine Ranges by Mr E.A, Marchant, and named *P. Marchanti*. Found at an elevation of nearly 3000 feet, while it was searching for worms – for all the paryphantas are carnivorous. They live entirely on worms. When a snail finds one coming out of its hole in the ground, or wriggling along, it covers it with its body, which is, of course, considerably larger than the ordinary garden species, and sucks it in. The largest paryphanta, which measures 7 ins. Across the shell, can exist on one fair-sized worm per week. The shells, beautifully and delicately marked, in various patterns and colours, range in size from this measurement down to a couple of inches.

On an island in Queen Charlotte Sound, is found, close to the water, a land snail known as *P. hochstetteri bicolor*. This island must have been, in the dim past, considerably higher than it is now, for the same species of snail is found on the elevated portions of the chain of hills running between the Sound and the ocean in the eastern side of it. It is not until the plains to the west of Nelson are crossed that the *P. hochstetteri* is located. Close to the road that winds over the Takaka Hills, this snail is found near the 2000 feet elevation. The shell attains exceptionally large proportions, varied markings, ranging from broad chestnut bands to narrow bright-red thread lines.

A quite distinct but much smaller snail, exists among the limestone formations surrounding the iron deposits from which the Onekaka Smelting Works are supplied. A 900 ft. climb, up a winding track, to the quarries, and several hundred feet above that is the haunt of this somewhat rare *P. fallax*.

From Onekaka a coastline of low elevation stretches along the northern portion of Nelson Province to the base of the Wakamarama Range. On this extensive range is found the snail named *P. Gilliesi*. It lives at a 2000 foot altitude above the Mount Burnett coal mine, its favourite haunt being the limestone outcrops lying around the hilltops.

Among the tall nikau palms that grow around and between two lakes at Kaikohe, near Collingwood, I have discovered another kind of snail, *P. gilliesi subfusca*, slowly crawling about, with a gloriously-marked shell, beneath the fallen decaying fronds.

One specimen I collected measured 7 inches across the shell. I kept it domiciled amid damp moss and fed it one worm per week – *P. superba.*

Now we cross the Gouland Downs and South to the Northern borders of the district known as Karamea, where earthquakes still rumble almost continuously, and shake the ground. Here we find a land snail that has not been named. I obtained 3 specimens of this almost unknown snail, gathered by the late Mr W. Bennett.

Close to Karamea district at an altitude of 120 feet and upward, the *P. Lignaria* Maoriland's most beautiful mollusca. Its shell is covered with yellow and reddish-brown axial (up and down) streaks, but these distinctive features are not evident in the species found near Westport. I the vicinity of which town may also be collected another small *P. unicolorata*, whose shell is uniformly an olive brown.

So far, no paryphantas have been discovered on the Westland Coast south of Westport, except a solitary specimen – *P. rosiana* – taken from Mt. Greenwood, at the isolated settlement of Ross in Upper Westland. This shell is now in the Auckland Museum.

Another paryphanta has very recently been found on Dome Mt., in Central Southland, and named *P. spedeni*, for J. Spedeni, is dicoverer.

In the "Manual of the N.Z. Mollusca," published in 1913, by Henry Suter, the names of only 5 paryphanta are given. Now they number 17 distinct varieties, and two more kinds have come under observation. One of these is located in Western Otago's Sounds, and the other in the Upper Buller River's watershed, Nelson Province.

Genus *Paryphanta.*

Animal having the body much wrinkled; foot capable of great extension laterally; rounded in front, pointed posteriorly; without mucous pore. There are no mantle lobes, but two small neck lappets, the left in two lobes, one next to the respiratory orifice, the other on the posterior side. Ommatophores long and rather slender. The eyes, on the dorsal side, some distance back from the terminal bulb. Mouth and buccal mass very muscular; the radual [*sic*] long and narrow. Radula with aculeate teeth, 29 to 135 in a transverse row. A central tooth is usually present. Reproduction organs simple. All the N.Z, species are carnivorous, mostly living on worms. In 1913 Henry Suter recorded 6 species, but 2 of these are now classed as Wainui, leaving only 4 species. Now we have at least 20 species:

Tasmania (1). Victoria (1). Louiscade Archipelago (1), British New Guinea (2). In the North Island of N.Z., (1) is found in N. Auckland among kauri trees, and not at a high altitude. (1) at Levin, near Wellington, almost at sea level; one high up on the Ruahine Range in Wellington Province. All the others are found in the South Island. *P. Busbi*, *P. Traversi*, P. Marchanti, North Island.

P. bicolor, Picton from sea level top of mountain 2000 feet. *P. obscura*, further West on high tops. *P. hochstetteri*, 2000 feet among limestone. *P. fallax* further West, high up on limestone. *P.*

gilliesi. P. gillies sub fusca, P. gilliesi (var. A.) *P.gilliesi* (?), *P. compta, P. superba, P.mouatae, P. Montana, P. Lignaria, unicolorata, P. rossiana,* Ross, South Westland, and one in Southland, *P. speddeni.*

It is generally considered these shells were all high mountain shells, and those now found on low country have been brought low by great land depressions. I have had a dozen live snails in a box full of a water moss that grows in the swampy places, for a year. I throw in fresh moss and worms, but the moss disappears, so they must eat that also.

The genus *Wainui,* and also *Schizoglassa,* are nearly related to our *paryphanta. Rhytida* is also much like the above, but very much smaller.'

The *P. Lignaria* was always considered to be the most beautiful of N.Z. land snails until lately, now *P. mouatae* takes first place.[1] It is beautifully marked; I and a friend have the only ones known.

It appears strange that in almost every case, with two or three exceptions, all these *paryphanta* are found on, or near limestone outcrops."

A COUPLE OF "MUST HAVES"

Margaret Morley has recently produced what is, undoubtedly, a "must have" for all our members – several of whom are already gloating over acquiring this most useful and beautifully ilustrated guide to our commoner shells: *A Photographic Guide to Seashells of New Zealand.*144p, illus. Auckland: New Holland Publishers (NZ) Ltd. 2004.

And you might have missed this (published in 1999) – more geographically restricted, but still a good one to own: *Southland Shells*, by Lloyd Esler (15 Mahuri Road, Otatara, Invercargill). 28p, illus.

---

[1] Well, she would say that, wouldn't she ? *Paryphanta mouatae* ... It was originally described by Powell in 1936 from the Gouland Downs, West Nelson, between 15 Mile Creek and Saxon Creek. Sadly, *P. mouatae* is no more, "sunk in synonymy', as is the fate of many presumed new taxa, now being part of *Powelliphanta hochstetteri superba* (Powell, 1930). If you want to read more about this rigmarole of subspecies and races in these snails, check on Frank Climo's paper, 'The *Powelliphanta gilliesi-traversi-hochstetteri-rossiana-lignaria-superba* ring species (Mollusk:' *NZ Journal of Zoology* 5: 289-294.. However, *Taron moutae* Powell, 1940, survives to commemorate Mrs Mary Mouat and her interest in New Zealand shells. This one was described by Powell from Devonport, Auckland Harbour.

In passing, I'm fascinated by the writer's presumption that the ladies of the *Woman's Weekly* in 1935 would want to know about ommatophores and muscular buccal masses.

Rehder summarised it thus: "Inch (English and American = 2.54 cm & line ($1/12^{th}$ inch) = 2.11 mm; Pouce (French) = 2.71 cm & ligne ($1/12^{th}$ pouce) = 2.25 mm; Zoll (German) = 2.62 cm & linie ($1/12^{th}$ zoll = 2.18 mm – Based on the common Rhenish or Prussian foot."

We'll come back to these units later ...

I'm particularly talking about the units of measurements you'll come across if you try to read the original accounts of some the early French voyages that came as far as New Zealand, notably the two sets of expedition reports from Dumont d'Urville's voyages.[4] You can read an excellent summary of what the results of these voyages actually did to illuminate the natural history of New Zealand in Dr John Andrew's wonderfully illustrated book *The Southern Ark*,[5] but you will find a lot more, specifically about the hydrography, geography, language and customs of the Maori race in d'Urville's very perceptive original texts.[6] Fortunately, about 50 years ago Olive Wright produced excellent translations of both.[7]

In a much latter part-translation of both voyages by Helen Rosenman (really only dealing with the Australian part of the voyages – and doesn't even mention the sterling work of Olive Wright), lavishly and impressively produced at recently as 1987,[8] not much is said of the scientific reports of the expeditions (even dismisssing them as of little interest, "only curiosity value"[9]). So, the research worker on say, Crustacea or Mollusca, must go back to the original texts to see how particular species were described and especially to examine the very beautiful figures, often in vivid colour, done by the expeditions' artists. In these, and in d'Urville's own accounts of his ships' movements, you will find strange units of measurements – *lieue*, *mille*, *noeud*, *brasse*, *encâblure*, *toise*, in the navigational reports particularly, and *pouce* and *ligne* very often, and rather annoyingly in the descriptions of species. For instance, *Turritellla rosea*, a new species described from New Zealand by Quoy & Gaimard is recorded as having a length of "pouces 2, lignes 3".[10] (Suter 1913[11] recorded the type specimen as 60mm high). So, what does this mean?

At the aftermath of the French Revolution, Tallyrand presented a proposal of reform and international unification of weights and measures to the Constitutional Assembly of 1790; so that in due course on 7 April 1795 the Law of 18 Germinal An III instituted the Metric ssystem, the use of which was made obligatory by law on 4 July 1837. Needless to relate, Britain wouldn't have a bit of it, the Foreign Minister, the Duke of Leeds, being told to relay a definite "Non" to the French Government.[12] Even now the resistance goes on ... I recall the report of a British court who convicted a fruit and vegetable trader who refused to convert to the EU metric legislation and sell his goods in kilograms and grams, the Prosecutor saying that if Britain wanted to be part of Europe it had to abide by its laws.[13]

Previous to the post-Revolution law, as some French author once put it, "la plus joyeuse anarchie" reigned in France, so far as weights and measures were concerned. Units of measurement varied tremendously not only from province to province but from one village to another, and sometimes even within a single town. In Britain the situation was delightfully chaotic also – especially with measurements based on the commonplace "hundred", in that, for instance, a "100" sheep in Roxburghshire was actually 106, "120", called a "long-hundred" was used to include such items as 100 eggs, spars, nails, oars or tiles and stones, as many as 225 onions or garlic cloves.[14]

Getting back to D'Urville's texts, the two most important units (in conchology at least) are 'pouce' and 'ligne' (the latter not to be confused with 'line' as used in British natural history descriptions) ...

The terms *pouce* and *ligne* were French measurements of length used from 1350 to 1799, but they still appear in French writings in a more informal way.[15]

The *pouce* was a 1/12th of *'un pied'* or *'pied du Roi'*, which could be translated as the English 'foot' but was actually equivalent to 12.7893 of our inches (or, metrically, 324.84 millimetres) – so the pouce was actually 1.0657 inches, rather longer, then, than the Imperial inch (which is 25.4 mm).

The *ligne* was 1/12th of a pouce, 1/144th of a 'toise', or 12 points, i.e. 2.256 mm – although in French Canadian usage became 1/8th of a pouce.

Other units you'll find in accounts of early French exploring voyages (and as already noticed by Olive Wright[16] and Helen Rosenman[17] in their translations) include:

Une brasse, a measure of depth translatable as a fathom, i.e. 6 feet or 1.828m, but, in fact, only 5½ feet (1.677m) in French use.

Une encâblure, a cable, equal to 120 brasses (about 195 metres). The British cable was about 100 fathoms or 607½ feet (184.7 m), and in American use 720 feet (219.45m).

Une toise, a measure used before 1799 post-Revolution changes. This was about 1.9m or just over 6 feet, hence could be translated as a "fathom" for nautical uses (as in D'Urville's accounts). The *toise de France* or *toise du Roi* was 6 pieds of 12 pouces (where 1 pouce = 12 lignes and 1 ligne = 12 points, i.e. 1.9490363m); a *toise de Lorraine* was 10 pieds, i.e 2.858m, a *toise de Lyon* 2.5688468m, a *toise de Villefranche* 2.4362964m.

Un lieue, a league, which equals 3 nautical miles but this also had its variations too (*un lieue Gauloise*, 2222 kilometres, *un lieue de Paris*, which to 1674 was 1.666 toises and from 1674 to 1737 was 2000 toises or 3.898 kilometres after 1737).

Un mille, a French nautical mile, equivalent to 6081 feet or 1852 metres. This is also the 'International Nautical Mile' (as adopted in 1929 by the International Hydrographic Commission in Monaco as exactly 1852m (8076.11549 feet), being the equivalent distance spanned by one minute (1') of latitude, and now in EU legislation. The British or Admiralty nautical mile is 1853.18m or 6082 feet, or 1.15078 statute miles (the statute of land mile being 5280 feet (1609.344m), accepted internationally but first formalised in by Queen Elizabeth I in 1593 from the previous 5000 feet).

Un noeud, a knot, or one nautical mile per hour (as a unit of speed). A knot in British usage is 1.150 (statute) miles per hour or 1.852 kilometres per hour.

Are you confused yet? I imagine that D'Urville, his navigators, and his naturalists describing their new species, would have used the 'official' units of the time, *'de France'* or *'du Roi'* rather than any of the provincial or other units. D'Urville certainly followed the current French Navy use. However, one should bear in mind, when reading other accounts, that the time period in which the measurements were made or the report issued should be considered as to whether such usage was pre- or post-revolutionary.

Incidentally, have you ever wondered what the *metre*, the basis of the Metric System (or preferably now known as the SI, i.e. Système International d'Unité) actually is? Well, since 1889 the French had a bar of platinum-iridium kept at Sèvres on which two lines were engraved, between the centres of which (at 0°C) was the distance termed the metre. However, since 1960

the metre has been defined in atomic terms as the wavelength of the orange-light of the gas Krypton (expressed more scientifically as "the length equal to 1650763.73 wavelengths in vacuum of the radiation corresponding to the translation between the levels Zp_{10} and $5d_5$ of the Krypton-86 atom."[18] Are you any the wiser?

REFERENCES

ANDREWS, J.R.H. 1986: *The Southern Ark. Zoological discovery in New Zealand 1769-1900.* Auckland: Century Hutchinson New Zealand Limited. 238p.

ANDERTON, P.; BIGG, P.H. 1969: *Changing to the Metric System: conversion factors, symbols and definitions.* 3rd edition. London: Her Majesty's Stationery Office. 48p.

COOKE, C.M. 1941: Notes and News. Measurements used in shell descriptions. *The Nautilus* 54 (3): 107.

D'URVILLE, J. 1830-1835: *Voyage de découvertes de la Corvette 'l'Astrolabe' exécuté pendant les anneés 1826-1827-1828-1829 sous le commendement de M. Jules Dumont d'Urville Capitaine de Vaisseau.* 13 vols, 4 atlases. Paris: J. Tastu. [includes 4 volumes entitled "Zoologie" and 'Atlas' of two volumes, in 'Tomes' II and III of which are featured Quoy & Gaimard's descriptions of New Zealand molluscs.]

DOMINION 2001: 'Metric Martyr' convicted. *The Dominion* (Wellington) 11 April 2001: 5.

McGLASHAN, M.L. 1969: The International System of units (A tous les tems, à tous les peuples). *Otago Science Students' Association Science Record* 19: 6-7.

OXFORD-HACHETTE 1995: *The Oxford-Hachette Concise French Dictionary.* Oxford University Press. 1448p.

POWELL, A.W.B. 1979: *New Zealand Mollusca – marine, land and freshwater.* Auckland: Collins. 500p.

QUOY, R.C. ; GAIMARD, J.P.G. 1835: Mollusques. Zoologie. Tome III (& Atlas) in: D'Urville, D. 1830-1835, *q.v.*

REHDER, H. A. 1945: The measurement of shells. *Mollusca* (Tavares) 1 (6): 73-77.

ROSENMAN, H. (ed./transl.) 1987: *An Account of Two Voyages in the South Seas by Captain (later Rear-Admiral) Jules S-C Dumont* D'*Urville of the French Navy to Australia, New Zealand, Oceania 1826-1829 in the Corvette 'Astrolabe' and to the Straits of Magellan, Chile, Oceania, South East Asia, Australia, Antarctica, New Zealand and Torres Strait 1837-1840 in the Corvettes 'Astrolabe'* and *'Zélée'*. 2 vols. Melbourne University Press. [Volume I: 'Astrolabe 1826-1829', 312p, deals with the voyage on which Quoy and Gaimard collected shells in New Zealand].

WRIGHT, O. 1950: *New Zealand 1826-1827; an English translation of the 'Voyage de l'Astrolabe' in New Zealand waters, with an introductory essay by Olive Wright.* Wellington: Wingfield Press. 251p.

WRIGHT, O. 1955: *The Voyage of the 'Astrolabe' – 1840; an English rendering of the journals of Dumont D'Urville and his officers of their visit to New Zealand in 1840, together with some account of Bishop Pompallier and Charles, Baron de Thierry.* Wellington: A.H. & A.W. Reed 180p.

ZUPKO, R.E. 1968: *A Dictionary of English Weights and Measures from Anglo-Saxon Times to the Nineteenth Century.* Madison: University of Wisconsin Press. Pp xvi + 1-224.

ZUPKO, R.E. 1977: *British Weights & Measures: a history from antiquity to the seventeenth century.* Madison: University of Wisconsin Press. Pp xvi + 1-248.

ZUPKO, R.E. 1978: *French Weights and Measures before the Revolution: a dictionary of provincial and local units.* Bloomington: Indiana University Press. Pp xlvii + 1-208.

ZUPKO, R.E. 1985: *A Dictionary of Weights and Measures for the British Isles: the Middle Ages to the Twentieth Century.* Philadelphia: American Philosophical Society [*Memoir* 168]. Pp xxxviii + 1-520.

ZUPKO, R.E. 1990: *Revolution in Measurement: Western European weights and measurements since the Age of Science.* Philadelphia: American Philosophical Society [*Memoir* 186]. Pp xiii + 1-548.

---

[1] In Powell (1979: 456-457) you can find out how to convert fathoms to metres.

[2] Rehder 1945.

[3] Cooke 1941: 197.

[4] D'Urville, D. 1830-1835.

[5] Andrews 1986: 87-93 (account of the *Astrolabe* expedition and its naturalists in New Zealand waters, including (p. 89) one of Quoy's watercolours (from Pl. LXVIII) of "Q.&G." illustrating chitons collected at the Bay of Islands).

[6] D'Urville, himself, wrote 5 volumes of historical and ethnographical text (with 2 atlases of 243 plates of scenes and maps) in the series of 13 volumes produced as the Astrolabe expedition reports. In passing it's worth commenting here that his latest translator, Helen Rosenman, is very dismissive of D'Urville's efforts to record both his own and others' impressions of the history, geography, and Maori culture of New Zealand in 1827 - "Much of this material is of dubious value." And further remarked -"Such was d'Urville's enthusiasm for the 'noble savages' of New Zealand that he wrote 'an epic novel in the style of Telemachus', in six cantos, each preceded by invocations: a turgid moralistic romance about a Maori princess and her noble lover, which ends in tragedy ... It is quite awful and remains unpublished, buried in the French archives:" (Rosenman 1987: 107). Yes, I know this has nothing to do with Quoy & Gaimard or with shells, but it's intriguing nevertheless -- and I just had to include it! However, there ia a link because Gaimard, himself, kept a diary in which he, too, recorded much about contemporary Maori culturetre as well as natural history.

[7] Wright 1950.

[8] Rosenman 1987:.xiv.

[9] Rosenman 1987: 107

[10] Quoy & Gaimard 1835: 136-137, pl. 55, figs 24-26 in D'Urville 1839-35 'Zoologie, Mollusques' III.

[11] Suter 1913: 271). Quoy & Gaimard's measurement of 3 lignes converts to 67.68mm compared ith Suter's 60mm – so much for precision!.

[12] McGlashan 1969.

[13] See *The Dominion* 11 April 2001. The Weights and Measures Act of 1985 was in brought into line with European Union legislation on 1 January 2000. The use of the metric system has, in fact, been legal in Great Britain since 1864 but had been little use, except in scientific work, until the EU.

[14] See further details in the series of volumes by Zupko (1968-1990).

[15] Working out what a 'pouce' may be can become more complicated if you try to translate some everyday expressions – example, "She won't budge an inch" becomes "Elle ne veut pa bouger d'un pouce" (where a "pouce" is an "inch" in English usage, 25.4 mm, not perhaps the 27.069 it actually should be in France!) – see *The Oxford-Hachette Concise French Dictionary*, p. 484. Nowadays it can also be refer to a thumb or big toe – hence, 'se tourner les pouces' - to twiddle one's thumbs!

[16] Wright 1950: 244.

[17] Rosenman 1987: xv.

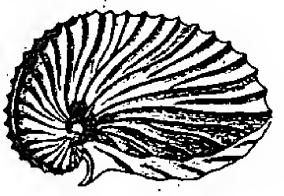
[18] Anderton & Bigg 1969: 21.

THOSE SCIENTIFIC NAMES - A FEW QUICK CLUES ABOUT 'ENDINGS'

There's great scope for some member to write about the meanings of the scientific names that have been given to our shells. (Jill's already made a start (see page 28 of this *Cookia*). Knowing something about what the name means can often help you to remember not only the name itself but, hopefully, to recall its salient features. Here is a brief guide, in general terms [there are lots of exceptions to some of this], as to what the 'endings' (suffixes, if you like, or more correctly 'terminations' according to the International Rules of Zoological Nomenclature) of the specific names of shells can imply.

1. Endings in '-i' ...shows that first part of the name refers to the (male) person after whom the shell has been named – e.g. *marshalli, delli, powelli, davegibbsi*;
2. Endings in '-ae' ... same meaning but this time it's a woman's name – e.g. *eugeniae, harrionae*;
3. Endings in '-orum' or '-arum' ... refers to more than one person, males firstly, next females – e.g. *hamiltonorum*, r*burchorum, turnerarum*;
4. Endings in '-ensis' ... indicates where the species may have first found - although frequently it's been found in other places too! - e.g. – *chathamensis, kapitienis, haurakiensis*;
5. Endings in '-escens' or '-ascens' ... indicates a verbal adjective denoting a quality, for instance colour – e.g. *albescens, hebescens, rubescens*;
6. Endings in '-oides' ... indicates that the species resembles the shape or other aspect of word so qualified – e.g. *Conus zebroides* – a cone that looks like a zebra (pattern), *nassoides, ostreoides* etc.;
7. Endings in '-icus', '-ica', '-icum' ... indicates the habitat or locality of a species – e.g. *Conus queenslandica*, a cone shell from/found in Queensland';
8. Endings in '-atus', '-ata', '-atum' ... may refer to the kind of ornamentation or sculpture of a shell, for instance – e.g. – *Goniodoris punctata*, ornamented with ', or *Conus arenatus*, sculpture like sand grains;
9. Endings in '-arius', '-aria', '-arium' ... indicates that the species appears to be like the animal or object in the first part of its trivial name – e.g. *Conus testudinaris*, a cone shell resembling a turtle;

Does that help? Or are you still confused? These are only some of the kinds of 'endings' you'll come across (there's '–cola', '-phila' and many others). See what you find and decipher in the New Zealand Checklist. There's great scope for a bit of biographical research as well. Who does *mestayerae* or *oliveri* or *judithae* or *mackenae* commemorate, let alone *Penion cuvierianus jeakingsi* ? And the story behind *Asperdaphne expeditionis* Dell, 1956 ? Check out why *Xylodiscus osteophila* B.A. Marshall, 1994 is so interesting, too.



THE LATTER DAY ARGONAUTS

By Jill Burnet

What does the word 'Argonaut' mean to you? Your answer will probably depend on whether you are a nutty shell collector, or a classical scholar. The original argonauts in ancient Greek legends weren't looking for shells, but for a golden fleece, which was hidden in a grove in the kingdom of Colchis on the Black Sea coast, guarded by a wakeful dragon. How the fleece got there is another long and involved story. The leader of the argonauts was Jason, the rightful heir to the throne of Iolcos in Thessaly. When he came of age, and tried to claim the throne from his uncle, who had taken it from his father, his uncle set him the seemingly impossible task of obtaining the golden fleece before he would give up the throne to him. Jason had Argus build a ship, reputed to be the first ocean-going vessel, which he called *Argo*, and invited 50 young men from throughout Greece to join him on this venture. They were called the 'Argonauts', from the name of the ship – ἀργός (argos) means 'swift', but also 'shining' or 'glistening' (more appropriate for a shell), and ναύτης (nautus) a 'sailor' – which gives us the word 'nautical' in English.

All this happened in the days long before they knew that time was money, and the Argonauts wandered over the seas and had many adventures before they accomplished their mission. The nautilus is a shell that wanders far and wide, and perhaps Linnaeus had this in mind when he named it. It certainly is as desirable as the golden fleece among many of our Wellington Shell Club members! The most besotted and most fortunate of nautilus collectors is Bill Shortt, as Kris Woods and others who have visited him will testify (refer to Kris's article 'Argonut' in *Cookia* Vol. 13). Last year Bill was featured in the *Hawkes Bay News*, and this inspired even those of us who haven't seen his collection – everyone now is mad keen to find a nautilus and so triumphant when they do. Several members have been lucky. Deirdre Standish came to a meeting and showed us, with great satisfaction, a perfect baby nautilus that she and Digby had found at Owhiro Bay. Rob and Carolyn McDonald were just as pleased about the little one they found at Princess Bay. Kris Woods told us that Merrin found one at Makara, and Jenny Raven's brother picked one up at Flat Point, on the Wairarapa coast. It seems that the Mahia area is particularly favoured – Geoff Foreman wrote that he had found only five worth having on Portland Island – only five! – when most of us are delighted to find one, or even, like Ian Townsend, a *piece* of one. And, as for Bill Shortt, he has been sending us emails advising us of his latest tally, now exceeding 50, and these, you will understand, are just the ones he thinks are worth picking up.

I don't know whether this is still inspiring us, or just filling us with envy and despair. But, hark back to the Greeks again, "He who is not envied, is not enviable." (Aeschylus), and Bill Shortt certainly has an enviable collection of argonauts!

This illustration was taken from *Elements of Conchology: or, an Introduction to the Knowledge of Shells*, by Emanuel Mendes da Costa. Published in London in 1776 ("Printed for Benjamin White, at Horace's Head, in Fleet Street.. MDCCLXXVI.")

Mendes da Costa (1717-1791) was the son of a Jewish merchant in London. He was intended for the legal profession and was apprenticed to a notary, but from his early years he applied himself with enthusiasm to the study of natural history, excelling particularly in conchology and mineralogy. In November 1747 he was elected a Fellow of the Royal Society. Although he succeeded greatly in the study of shells, and corresponded with the leading naturalists of the day, his life was a continuing struggle with adversity – in 1754 he was imprisoned for debt and his shell collections were held in bond. Thanks to the support of scientific colleagues, he became a Clerk with the Royal Society in 1763 but he was dismissed in 1767 for various acts of dishonesty, then arrested and committed to the King's Bench prison. His library and his collections were seized and sold by auction in May of the following year. He was released in 1772 and supported himself by lecturing, but he was frequently in debt. In 1774 he petitioned to be allowed to give a course of lectures at the University of Oxford bit was refused outright. From then on he continued a life of hardship until his death in 1791. His treatise *Elements of Conchology*, which we treasure so highly, reveals nothing of his sad life but ensures his everlasting fame as a Conchologist. Truly, we little know the background to such item ... (Pages 168 to 172 contain some most interesting notes on what was then known of the nature and habits of the Nautilus.)

This book, bequeathed to Te Papa by Mrs Helen Oliver, widow of Dr W.R.B. Oliver, former museum director and onetime conchologist, is but one of the many old and rare books in the library of the Malacology Section of Te Papa, housed in the Tory Street premises. This library is outstanding in its holdings, being actively built up by Bruce Marshall, and it rivals similar libraries worldwide.

'OPEN NOMENCLATURE' - THE PITFALLS OF "?", "cf.", "aff."

By Elliot Dawson

Those scientific names! They always seem to changing, brackets, commas, authors' names, dates and so on. Are they important? Do they really matter? Why do editors sometimes get titchy? Yes, indeed, they *do* – all of them. "If a thing's worth doing, it's worth doing properly" – so someone once said – and this goes for what we do in our "hobby" too. We've got to be pretty meticulous in how we record information – be it in our published articles or on our specimen labels. Both situations are important – what we write, we leave to posterity – and our labels, too; you never know what other collector or museum will inherit them – and curse you for not giving as much detail as you knew at the time of collection.

Life can be confusing, then, for the amateur conchologists (bearing in mind that most conchologists, shell collector, or whatever 'amateur') but don't be worried, 'professionals" (those lucky people who are paid to indulge in their hobby) have their own confusion too. And I'm referring to the use of what's called "Open nomenclature" [*Nomenclatura aperta*][3] – the use of "?", "*cf.*" [*confer*], and "*aff.*" [*affinis*] which , even as an amateur, you're bound to come across sometimes in lists of identifications (perhaps most often of fossils). It looks fine, but there isn't general agreement. So, be warned; what it means can be ambiguous, and, if you're ever tempted to use these "qualifers" for your own identifications, do spell out what you mean in words – or if you have lots of them, put in a "legend" explaining how *you* are using these terms.

Dr Roger Cooper of the former NZ Geological Survey found a wide disparity in the use of these qualifying terms, and asked a sample of 19 of his palaeontological colleagues how each of them used these terms (Cooper 1970). For "*cf.*" there was some general agreement (17 of 19, with 4, 3, and 1 other uses), similarly for "*aff.*" (17, with 2 colleagues having another use). For the use of "?", four cases were offered 1, "?Genus species", 2. "Genus? Species", 3. "Genus ?species", and 4. "Genus species ?" It was concluded that there was a wide range of meanings for "*cf.*", the most commonly used qualifier, and general agreement for the use of "*aff.*", but very little consistency in the meaning (or the position) of the "?").

Bengston (1988) gave his "impression" of what palaeontologists used, in his experience, particularly commenting on an earlier suggestion by Lucas (1986) *aff.* and *cf.* expressed different *degrees* of uncertainty whereas he concluded from his survey of usage that: "If uncertainty is involved, it is rather a matter of different *kinds* of uncertainty." Bengston's summaries as to each use are included in the following table, and now seem to be widely suggested for current use.

There is much variation in publications also, including such guides to taxonomic procedure as Schenk & McMasters (1956) and various sets of 'Instructions to Authors' issued by publishers and editors. Rather surprisingly, the old favourite 'bible' of taxonomists, *Methods and Principles of Systematic Zoology* (Mayr *et al.* 1953) doesn't have much to say about this problem, except these words of cautionary advice:

"It sometimes happens that existing knowledge and available material are not sufficient to place a specimen positively. In such cases the specimen should be set aside to await further material or evidence. Tentative or

[3] Open nomenclature is "the procedure by which a taxonomist comments upon the identity of a specimen that cannot be readily or securely determined ... Uncertainty or the provisional status of a taxonomic identification may be expressed in prose, such as 'probably *Agenus aspecies*', but is more often codified through the use of qualifiers such as aff., cf., or ?" (Bengtson 1988: 223).

doubtful identifications should always be clearly indicated as such by means of a question mark [but where to put it? - see my table !]. Unfortunately, most large collections contain numerous examples of doubtful or hasty determinations ..." (Mayr *et al.* 1953: 78).

TABLE OF COMPARATIVE USAGE OF TAXONOMIC QUALIFIERS

Reference	"*aff.*"	"*cf.*"	"?" 1. "? Genus species" 2. "Genus? species" 3. "Genus ? species" 4. "Genus ?species" 5. "Genus species?" 6. "?Genus species"
Stewart 1927			"When a question mark is placed after a generic name or between the generic and specific names, it indicates that the correctness of the generic name is doubtful; when placed after the species name it refers only to the species, but when placed in front of the generic name the correctness of the whole citation is doubtful."
Richter 1943		Attribution to the species is probable but uncertain [*i.e.* less certainty than "?" *fide* Bengtson 1988].	Attribution to the species is improbable but possible.
Richter 1948		Implies only a possibility of comparison with the named species [*i.e.* greater uncertainty than "?" *fide* Bengtson 1988].	
American Museum of Natural History (Tyler 1953)			See 6 variations above - 1. = entire assignment doubtful; 3. = species doubtful, but assigned to correct genus. 6. = species questionably assigned to genus.
Schenk & McMasters 1956	"Having affinity with but not identical with."	"To be compared to."	
Hornibrook 1968	"specimens related but not necessarily conspedific."	"specimens too few or too poorly preserved to be certain of their identification."	

Reference	"*aff.*"	"*cf.*"	"?"
Cooper 1970 [of 19 respondents, numbers in each case in square brackets]	[3] "Preservation adequate; definitely slightly different (probably at subspecific level)"; [1] "Preservation adequate; conspecificity uncertain (for taxonomic reasons)"; [4] "Preservation inadequate or insufficient material; conspecificity uncertain"; [12] "Preservation adequate or inadequate; definitely slightly different or conspecificity uncertain."	[17] "Preservation adequate; definitely different for taxonomic for taxonomic reasons (probably at specific level) but related"; [2] "Preservationadequate; significant difference in age, therefore conspecificity uncertain" [for fossil pollens at least].	a. "? Genus species" [8] "Genus and species doubtful (grounds unstated)"; [8] "Genus doubtful (on taxonomic grounds)"; [1] "Don't use". b. "Genus? species" [1] "Genus and species doubtful (grounds unstated)"; [9] "Genus doubtful (on taxonomic grounds)"; [1] "Preservation inadequate; conspecificity uncertain"; c. "Genus ?species" [1] Preservation adequate; conspecificity uncertain (on taxonomic or other grounds)"; [4] "Preservation inadequate; conspecificity uncertain"; [10] "Don't use"; d. "Genus species?" [3] "Genus and species doubdtful (grounds unstated)"; [6] Preservation adequate; conspecificity uncertain (on taxonomic or other grounds)"; [3] "Preservation inadequate; conspecificity uncertain"; [5] "Don't use".
Matthews 1973 [4]		Implies only a possibility of comparison with the named species	Means attribution to the species is possible but cannot be thought certain.
Smithsonian 1973			2. = species questionably assigned to genus; 5. = species doubtful, but assigned to correct genus; 6. = entire assignment [genus + species doubtful].

[4] Matthews (1973) is said by Bengtson (1988) to be "essentially a translation of Richter's work" (1943, 1948), wherein "Richter emphasized the need for open nomenclature: should a specimen be too hastily referred to a known species or genus, taxonomic information may be concealed or distorted. If on the other hand the specimen is left without any attempt at identification, potentially useful information may be left in limbo."

Reference	"*aff.*"	"*cf.*"	"?"
US Geological Survey (Bishop 1978)	"implies close affinity but probable or known difference in detail"	"indicates general similarity and the possibility that identity might be established if direct comparison were possible, or if adequate material were available for comparison."	2. = species questionably assigned to genus; 5. = species doubtful but assigned to correct genus; 6. = entire assignment [genus + species] doubtful;
Kornicker 1979			"Species questionably assigned to genus"; "Species doubtful, but assigned to correct genus"; "Entire assignment doubtful".
Lucas 1986		See analysis by Bengtson (1988: 225) of Lucas;s "contorted" motives for correct syntax in using "*cf.*" in relation to the specific name.	
Estes 1987	"*aff.*" indicates a greater degree of confidence than. "*cf.*"		
Zidek 1987	"*aff.*" and "*cf.*" are synonyms. Their meaning is equal to "?":		
Bengston 1988	"aff (or n. sp., aff., or sp. nov., aff,) preceding a species-group name indicates that the specimen(s) is considered a new, previously undescribed species or subspecies. The material is insufficient for formal description and naming of a new taxon, but the specimen(s) can be most closely related to the species or subspecies following the qualifier. Thus, aff. does not necessarily involve uncertainty." RECOMMENDATION: "aff. relates a new, undescribed taxon to a named taxon." – *e.g. Agenus* aff. *aspecies* for a new species.	"cf. preceding a species-group name … indicates that the determination is uncertain, the reason for which may be poor preservation of the material studied or that the determination is provisional." RECOMMENDATION: "cf. indicates that the identification is provisional" - *e.g. Agenus* cf. *aspecies* for a provisionally identified species.	"? Overlaps partly in usage with cf., although the former is less frequently used for provisional determinations." 'Considered synonymous … by a majority of taxonomists" with "*cf.*" RECOMMENDATION: "? Indicates that the identification is uncertain: - *e.g. Agenus*? *aspecies* = genus uncertain, *Agenus aspecies*? = species uncertain; *Agenus*? *aspecies*? = both genus and species uncertain.

After Bengtson's paper appeared in 1998, the New Zealand palaeontologist Hamish Campbell forthwish drew the attention of his colleagues to the recommendations contained in it, exhorting that they be adopted on the local scene. It was regrettable that Bengston, working in Sweden, had been unaware, understandbly, of Roger Cooper's 1970 survey (as published in local geological society newsletter), Campbell (1988) noted that Cooper's findings were very close to the uage recommended by Bengtson, and commented: " However, Bengtson's uage of "aff." is much more specific, relating only to new taxa. I believe this usage will have wide appeal because it will eliminate much of the overlap and inconsistency in usage of "cf." and "aff." Campbell also noted that the then-current guidelines for users of the New Zealand Fossil Record File make a distinction between "cf." and "aff." on the basis of implied phylogenetic relationship - "cf. compared with, but definitely different from; no phylogenetic relationship implied. aff. affinity with but not identical to; phylogenetic relationship implied." Campbell remarked further ...

"This usage is unsatisfactory because phylogenetic relationship is usually implied when these expressions are used, particularly at species and genus level. So, in this instance "cf." and "aff." really mean the same thing and many of us would say that "cf." implies a more distant relationship than "aff." Again, I feel that Bengtson's recommendation is a good solution to a very old problem – reserve uage of "aff." for new taxa only and use "cf." for all provisional identifications (for whatever reason) ... I adhere to his recommendations and would urge others to follow suit ...."

In a more recent statement, Campbell *et al.* (1993:14) say: "The recommendations of Bengtson (1988) are followed particularly with regard to the use of qualifying symbols "?", "cf." and "aff." The symbol "?" indicates that the identification is uncertain, e.g. *Agenus*? *aspecies* (genus uncertain)' *Agenus aspecies*? (species uncertain); *Agenus*? *aspecies*? (both genus and species uncertain); "cf." indicates that the identification is provisional; "aff." relates a new undescribed taxon to a named taxon."

There you have it – the real answer is: if in doubt, spell it out ...

An earlier usage of "aff". and "cf." of some interest is in the classic study of British Carboniferous non-marine bivalves published by Trueman & Weir in 1946, and discussed by Eagar, another specialist in this group, in 1956 when he was examining alternative methods that had been proposed of naming fossils based on statistical, rather than morphological, descriptions. Here, the specific name was limited to forms which are "practically" identical with the holotype of the species where, by figures and tables of shell dimensions, the "desirable" extent of variation from the holotype could be indicated. When plotted as a "scatter" diagram, a larger circle could be drawn these plots to define the extent of variation allowedf to forms in which the specific name was prefixed by "aff." As Eagar noted – "For other forms, not known to be related to the holotype, although possibly showing greater similarity to it in some features, the use of the prefix 'cf.' is recommended."

So, you see – there was a real need for someone like Bengston to come forward and attempt to clear these grey areas ...

The placing of the "?" is *particularly* tricky to interpret. Is it closer to one than the other or plumb in the middle? Have a look at some uses found by Kornicker (1979) ...

	US Geol. Survey 1978	Amer. Mus. of Nat. Hist 1953	Smithsonian Institution
Species questionably assigned to genus	*Spirifer? grimesi* Hall	?*Spirifer grimesi* Hall	*Spirifer? grimesi* Hall
Species doubtful, but assigned to correct genus	*Spirifer grimesi* Hall?	*Spirifer* ?*grimesi* Hall	*Spirifer grimesi*? Hall
Entire assignment doubtful	?*Spirifer grimesi* Hall	? *Spirifer grimesi* Hall	?*Spirifer grimesi* Hall

One of answers to all this confusion seems to be that, in many cases, editors of scientific journals have specified how these terms should be used in their particular publications, and this advice varies. For instance, the *Journal of Paleontology* merely says you can put a qualifier between the generic and specific names (e.g. *Agenus* cf. *aspecies*") but doesn't say what it means! But it does refer the would-be author to Bengston 1988. *Palaeontology*, the journal of the Palaeontological Association in the U.K. states: "Authors should follow the guidelines given by Matthews (1973) and Bengtson (1988). Similarly, the Geological Society of London advises authors to do the same for their *Quarterly Journal. The Palaeobotanist*, the journal of the Birbal Sahni Institute of Palaeobotany in India, advises caution too: "Open nomenclature ... should be dealt with care. For more details consult Matthews S C 1973 ... and Bengtson P 1988 ..."

Of the one I've seen so far I like the Geological Society of Canada's Guide best – *viz.* 1. [aff.] *Leptaena* sp. aff. *L. rhomboidalis* (Wilckens) = closely related to *L. rhomboidalis* but probably a new species; 2. [cf.] *Leptaena* sp. cf. *rhomboidalis* (*Wilckens)* = similar to *L. rhomboidalis* and possibly conspecific with it; 3. [?] *Leptaena? concava* Hall – identification at the generic level in doubt, but species identification believed to be correct; 4. *Leptaena concava* Hall? = identification at the species level in doubt, but generic identification believed to be correct; 5. ?*Leptaena concava* Hall = whole identification doubtful; 6. ?*Leptaena* sp. cf. *L. rhomboidalis* (Wilckens) = whole identification doubtful.

Bengston has also recommended that the generic name should <u>not</u> be repeated in the form ... *X-us* cf. *X-us albus*, as often previously used- "Abbreviated taxonomic expressions such as '*Trichiurus* cf. *lepturus*' are unambiguous and are to be preferred to '*Trichiuris* cf. *T. lepturus*.' He notes, in criticism of Lucas (1986) – "To write *T.* cf. *T. lepturus* ... contributes nothing to clarity." It is incorrect syntax, implying that "the specimen(s) should be compared to only those specimens that have been described under the name *T. lepturus*, which is hardly what is mean" – which, in Bengston's view, is conveyed "in an unambiguous way the message that the author considers the specimen in question to be 'probably or possibly the species *lepturus*, altough there is not enough material to be sure, but if it is *lepturus* it should be referred to the genus *Trichiurus*.'"

And what does "sp." signify? As identifiers of living shells, rather than fossils, we'll come across this quite a lot. It can denote a laziness in identification – more time and trouble needed to chase up the literature – or it's too damaged to show more than what genus it falls into – it just couldn't be identified – as the palaeontologists might say – for 'taxonomic' reasons or the state of its preservation. It's a pity if we can't say which category of "sp." we mean in each instance. It may be possible sometimes, with the right resources, to be able to resolve a 'taxonomic' "sp."

You might also see "sp. indet." after a name ("species indeterminata"). This simply means that, generally because of the physical state of this particular specimen, it is not possible (?couldn't be or can't be) to be identified as to species – "indeterminable", if you like.

Finally, I'm not sure what point Bengtson (1988: 223) was trying to make when, quoting Richter (1948) and Matthews (1973), he remarked that "open nomenclature is an essentially perspicacious form of nomenclature" – and further, "Careful and judicious use of open nomenclature reflects scientific honesty, its use is not a sign of weakness or lack of confidence, contrary to the opinion of some taxonomists" [*cf.* Mayr *et al.* 1953: 78] One wonders if the word " perspicuous" might have been more descriptive. According to my OED, "perspicacious' means "Having insight, penetrating", "Of clear and penetrating sight; clear-sighted", "Of penetrating mental vision or discernment") whereas what Bengston may have really meant was "perspicuous" meaning "expressed or expressing things with clearness, lucid," "Clear; clearly expressed, lucid; evident". One could hardly state that usage of "aff.", "cf.", and "?" have been either " perspicacious" or "perspicuous" up to the present time. Nonetheless, heed Bengston's next

sentence – "Careful and judicious use of open nomenclature reflects scientific honesty, its use is not a sign of weakness or lack of confidence, contrary to the opinion of some taxonomists."

So there you have it, go carefully with your use of "*aff.*", "*cf.*", and "?" – if you *must* use them.

REFERENCES

BENGTSON, P. 1988: Open nomenclature. *Palaeontology* 31 (1): 223-227.

BISHOP, E.E. *et al.* 1978: *Suggestions to Authors of the reports of the United States Geological Survey.* 6th ed. Washington, DC; U.S. Government Printing Office.

CAMPBELL, H.J. 1998: The expression of doubt in the identification of fossils (open nomenclature). *Geological Society of New Zealand, Newsletter* 81: 15-16.

CAMPBELL, H.J. *et al.* 1993: Cretaceous-Cenozoic geology and biostratigraphy of the Chatham Islands, New Zealand. *Institute of Geological & Nuclear Sciences, Memoir* 2: 270p.

COOPER, R.A. 1970: The meaning of "*cf.*", "*aff.*", etc. as used by paleontologists. *Geological Society of New Zealand Newsletter* 28: 36-39.

EAGAR, R.M.C. 1956: Naming Carboniferous non-marine lamellibranchs. *Systematics Association Publication* 2 ('The Species Concept in Palaeontology'): 1111-116.

ESTES, R. 1987: Lucas and Zidek on taxonomic syntax. *Journal of Vertebrate Paleontology* 7: 101.

KORNICKER, L.S. 1979: The question mark in taxonomic literature. *Journal of Paleontology* 53 (3): 761.

LUCAS, S.C. 1986: Proper syntax when using *aff.* and *cf.* taxonomic statements. *Journal of Vertebrate Paleontology* 6: 202.

MATTHEWS, S.C. 1973: Notes on open nomenclature and on synonymy lists. *Palaeontology* 16 (4): 713-719.

MAYR, E. *et al.* 1953: *Methods and Principles of Systematic Zoology.* New York: McGraw-Hill.

RICHTER, R. 1943: *Einführung in die Zoologische Nomenklatur.* Frankfurt-am-Main: Senckenbergische Naturforschende Gesellschaft. Pp 1-154.

RICHTER, R. 1948: *Einführung in die Zoologische Nomenklatur.* 2nd d. Frankfurt-am-Main: Kramer. Pp 1-252.

SCHENK, E.T.; McMASTERS, J.H. 1956: *Procedure in Taxonomy.* 3rd edition. Stanford University Press. Pp viii + 1-119.

SMITHSONIAN 1873: *Smithsonian Style Manual.* Washington, D.C.: Smithsonian Institution Press.

STEWART, R.B. 1927: Gabb's Californian fossil type gastropods. Proceedings of the Academy of Sciences of Philadelphia 78: 306.

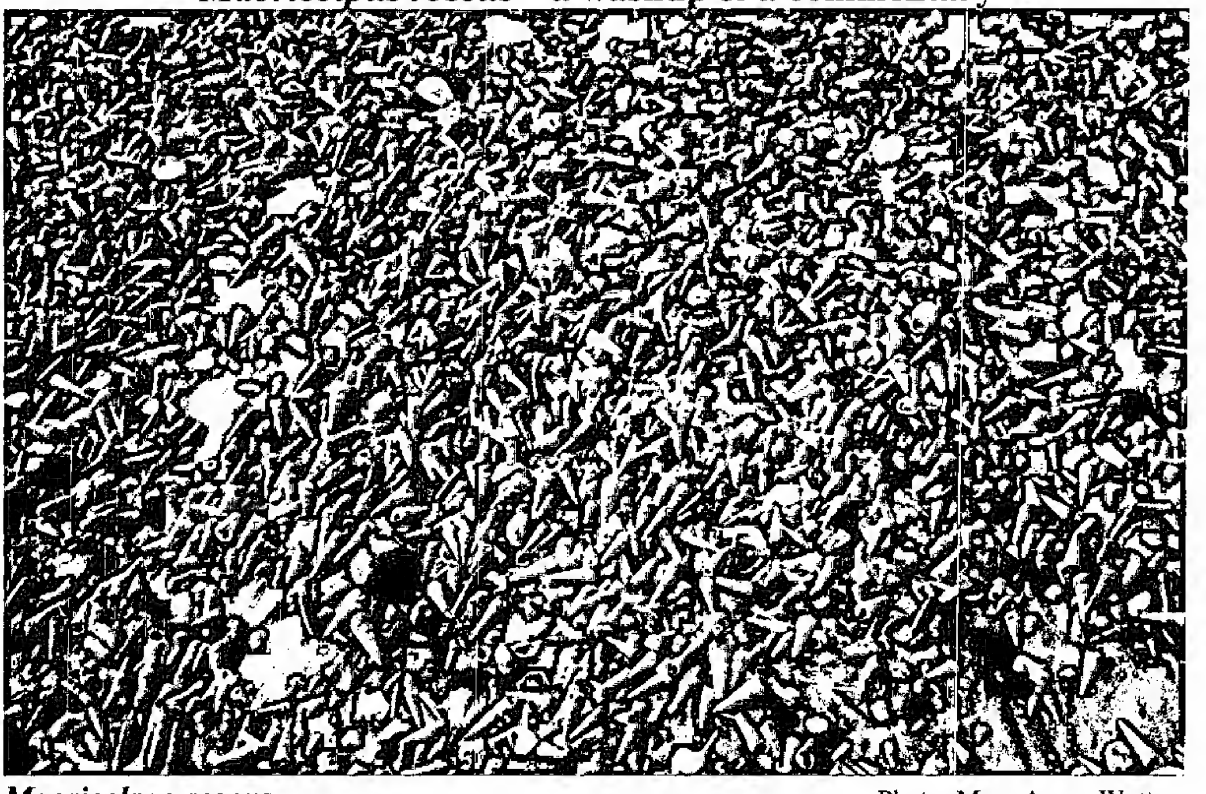
TYLER, R. 1953: *Style sheet for the scientific serial publications of The American Museum of Natural History.* 2nd ed. New York: The American Museum of Natural History.

USGS – see Bishop *et al.* 1978 above ...

ZIDEK, J. 1987: Response to Lucas on syntax in taxonomic statements. *Journal of Vertebrate Paleontology* 7: 100-101.

PS – I've just learned of a new one (to me, anway). One of my crustacean colleagues told me his identification of a deepsea kingcrab as "*Neolithodes* nr *nipponnsis*" – meaning, presumably, that he couldn't readily identify it but thought it was something a species described by the Japanese carcinologist Sakai some years ago as *Neolithodes nipponensis*, 'near' to it, in fact. Is that an OK usage?

Maoricolpus roseus – a washup & a commentary



Maoricolpus roseus ... Photo: Mary Agnes Wotton

A huge washup of *Maoricolpus roseus* at French Beach, Akaroa, in April 2004. The area was about 50 metres, all densely covered with shells.

Maoricolpus roseus (Quoy & Gaimard, 1834) is one the shells found during the voyage of the *Astrolabe* in New Zealand in 1827, and described by) Jean-René-Constant Quoy (teacher and physician in the French Navy) and Joseph-Paul Gaimard (Staff-Surgeon and naturalist), members of the *Astrolabe* expedition, in "Tome Troisième" of its 'Zoologie' reports (1834: 136-137, pl. 55, figs 24-26). Their original description of "Turritelle rosée, *Turritella rosea*, nob." reads ...

" Tavaki, par les habitants de la baie Tasman. On trouve cette espèce par quelques brasses de profondeur dans l'anse de l'Astrolabe, à la Nouvelle Zélande. Notre drague en amenait des milliers d'individus morts, parmi lesquels en trouvait fort peu de vivants. Longueur 2 pouces 3 lignes. Diamètre de la base ... » 8."

Powell (1979:125-126, pl. 29:6) records *Maoricolpus roseus* as occurring from the lower Pliocene (Waitotaran) to the Recent, ranging the North and South Islands, Stewart Island and the Chathams, from low water to 50 fathoms ([91.4m]. *Maoricolpus roseus manukauensis* Powell "is a tall, narrow form, of similar shape to *Zeacolpus finlayi* Powell is based on shells with spirals also B and C [see Beu's fig. 1] stronger than the others, but this form is common in Nukumaruan rocks of Hawke's Bay where it intergrades with *M. roseus* and occasional Northland beach shells intergrade with *M. roseus*." (Beu 1977: 32). Powell (1979: 31, pl. 29:7) says of the habitat of his subspecies *manukauensis* Powell, 1931: "Mudflats and shallow water channels of the Manukau, Raglan and Kawhia Harbours" with its type locality being " Between Big Muddy Creek and Cornwallis, Manukau Harbour."

Maoricolpus roseus was introduced into Tasmanian waters in the 1920s with oyster shipments, but, although known to scallop fishermen there for 40 years or so, it was not officially reported until Alan Dartnall recorded it in a fisheries report in 1969. A Media Release from the Australian CSIRO has since reported its phenomenal spread from Tasmania up the eastern Contiental Shelf of Australia, some 1300 kilometres, into Sydney Harbour, ranging from low water to at least 100 m. Dr Nic Bax of the CSIRO Centre for Research on Introduced Marine Pests in Hobart, Tasmania, has been following its progress (together with one of our Club's former founding members Dr Winston Ponder of the Australian Museum). Dr Bax has commented that control opportunities are limited, the obvious management strategy being to restrict "anthropogenic" spread to the west. Together with the Asian Mussel *Musculista senhousia* and the European Clam *Corbula gibba*, the 'New Zealand Screw Shell', as the Australian call it, is inferred to be having an impact on the native marine fauna. As in New Zealand, *Maoricolpus roseus* has become the dominant element of the bottom fauna in many situations, notably in vast beds in Bass Strait. Other New Zealand shellfish occurring in Tasmanian waters and presumably brought in at the same time of the screw shells include *Amaurochiton glaucus*, *Neilo australis*, *Perna canaliculus*, and *Ruditapes largillierti*.

The CSIRO Media Release of 1st November 2000 quotes Dr Bax as saying of its reported spread to Sydney: "It's a millenium marathon with uncertain environmental consequences. There are very few predators that can break though the hard shell to eat it. Commenting further on the concern of scientists at the impact on other mollusc species, including native screw shells and shellfish-eating fish in the food chain, Dr Bax, estimating that this species now covers an area of sea floor about the size of Tasmania itself, remarked that *Maoricolpus roseus* is a threat to ther seafloor animals since it breeds so prolifically, smothering the seafloor down to 80 metres on the Continental Shelf. It has not yet been reported on the west coast of Tasmania or further west on mainland Australia. "We are only just starting to understand the habits of this species." He said. Researchers are currently gathering anecdotal evidence from Tasmania and Victoria, as well as doing new biological studies (Bax *et al.* 2003), to build up a profile of *Maoricolpus roseus* and its progress in Australian waters.

REFERENCES

BAX, N.J.; GOWLETT-HOLMES, K.L.; McENNULTY, F.R.. 2003: Distribution and biology of the introduced gastropod, *Maoricolpus roseus* (Quoy and Gaimard, 1834) (Caenogastropoda: Turritellidae) in Australia. *Technical Report, Centre for Research on Introduced Marine Pests* No. 25.

BEU, A.G. 1977: New Zealand Turritellidae. *Cookia* 2 (1): 31-35.

CSIRO 2003: Screw shell's marine marathon. Media Release – Ref 2000/287 – Nov 01, 2000.

DARTNALL, A.J. 1973: Marine molluscs of Tasmania. *The Tasmanian Year Book* No. 7 (1973): 51-58.

QUOY, J.-P.-C; GAIMARD, J.-P. 1834: Mollusques. Vol. III. *Voyage de découvertes de 'l'Astrolabe' ... pendant des années 1826-1827-1828-1829, sous le commandement de M. J. Dumont D'Urville. Zoologie par MM. Quoy et Gaimard.* Paris: J. Tastu. Pp iv + 5-954.

POWELL, A.W.B. 1979: *New Zealand Mollusca – marine, land and freshwatershells.* Auckland: Collins. 500p.

Photograph and field notes by Mary Agnes Wotton; text compilation by Elliot Dawson.

IS A "RARE SHELL" REALLY "RARE"? SOME VALEDICTORY THOUGHTS ON DEEP-SEA COLLECTING

By Elliot Dawson

"Questions about the commonness and rarity of species are of fundamental interest, and have important applications in conservation biology and elsewhere."

['The search for patterns in the balance of nature: advances and retreats.'
R.M. May, 1986 *Ecology* 67: 1115-1126.]

One of the interesting aspects of the occurrence of animals in the deep-sea, molluscs in particular, is that of relative abundance. For instance, quite a few species are known from only a single specimen, whether it be dead or alive. Such shells would certainly come into the category of "rare shells" in terms of Peter Dance's well-known book on the subject (Dance 1969).

It's all "relative", really;[1] you'll recall how Powell, in his various checklists, categorised his New Zealand species as "common", "not uncommon", "rare" – these are all relative terms, and have had to be changed for many species as they became better known.[2] Similar scales of abundance have used in marine biology for other kinds of animals: for example, in the starfish order Paxillosida, represented in New Zealand by 38 species, 26 are considered "rare" (i.e. with less than 10 records), 5 are "uncommon" (15-34 records), 6 are "relatively common" (87-116 records) while only one species was considered "abundant" (with over 400 records) (Clark & McKnight 2000: 131-132). So far as Powell's categories are concerned, I always used to worry about how a species could be "not uncommon" – if it wasn't uncommon, what was it? Common? Such scales obviously differ considerably according to the purposes for which they are proposed but "rare" does have a particular connotation in most people's minds.[3] I came across two curious ideas, on the local scene, of what the rarest New Zealand shell might be –

"The rarest New Zealand mollusc is the toheroa which is much sought after by overseas buyers, but strictly controlled in order to conserve numbers:"

The Dunmore Book of New Zealand Records 2nd ed., 1978
(Chapman 1978)

"The rarest endemic [New Zealand] shell is *Latiaxis wormaldi* Powell 1971, the only specimen of which was dredged up from 329m 1,097ft off the east coast of Northland.

New Zealand Supplement to the *Guinness Book of Records* 24th edition, 1977
(McWhirter 1977)

I asked Bruce Marshall at Te Papa what he thought the "rarest" New Zealand shells are, and his reply, succinct as usual, was - "Any species of which there is only one known specimen", and, in fact, "Any species of which the only known specimen has been lost or destroyed" – perhaps that's because we know that it *did* once exist!

In my 35 years with the New Zealand Oceanographic Institute, dredging and trawling throughout New Zealand seas, in the Subantarctic, the Antarctic, and the tropical South Pacific, I frequently collected "rare" shells – and even when, subsequently, we found a good many species to be quite "common", it was still a real thrill to see them come up from the seafloor for the first time.

It was our sampling strategy to take a series of "grabs" (or "dips" as our naval colleagues called them) at each "station" – that being a position at sea above a particular part of the ocean floor which we wished to sample, hence the oceanographic expression "occupying a station". If the nature of the bottom was rather (or absolutely) unknown (even as best revealed by a trace on the echosounder which was used in the first place to monitor the depth but which could, with varying degrees of success, be used to elucidate whether it was sand, mud, rock or so on below use) we generally put over a dredge, constructed solidly enough to bring up a good-sized sample. Our "rock dredges" were, in fact, extraordinarily well built, able to knock off chunks of pretty hard bottom – but even such dredges could be quite badly damaged, or even completely lost (off Macquarie Island lie several such testimonies to my own lack of skill in deciding where to sample!). We also had a thing called an Orange-peel Grab, which was constructed as several conical-shaped hinged segments like a partly peeled orange which closed together when tripped and, with any luck, brought up a chunk of the sea floor after its weight had allowed it to dig into it. OPGs really only worked on soft sediments in fairly shallow water (I used one pretty successfully in my 1964 survey of the benthic animals of Wellington Harbour; Dawson 1998).

A cone-mesh dredge with inner bag (DCMb)

But in deeper water we generally used a dredge, either a conical-shaped one with a wide metal cutting rim and a canvas bag held inside, or a long one like a cylindrical metal basket which could also have a bag in it to hold fine sediment. Some of these came up mighty twisted on occasions! If the bottom was found to be smooth enough, devoid of nasty rocks and so on, we could then put down a trawl, which would slide over the seafloor collecting animals on its surface. But, of course, the dredge or grab had helped us to find out what was living deeper in the sediment than merely on its surface.

The trawl had two u-shaped frames in front acting as flat runners so it could land on the seabed either way up and still travel over its surface. Attached to the frame, which was supported on a beam of various widths, was a long netting bag, which could be of coarse and fine mesh sizes. This gear was known as an Agassiz Trawl (modelled on an United States device used on early oceanographic cruises there), and we made it in various beam widths, 2 foot, 4 foot, 6 foot, hence small, medium, and large, recorded in our work as TAS, TAM, and TAL respectively.

Orange-peel Grab (GOP or OPG) and Agassiz Trawl (TAM)

We used other more specialised trawls such as the Menzies Trawl and the Epibenthic Sledge or SEM – which was a monster of a thing but very good at getting hosts of minute crustaceans and

molluscs. The trouble with the Agassiz trawls was that they didn't bring up a sample of the bottom sediment – except what happened to be attached to any of the shells or so on. However, one of our ingenious workshop people was able to solve this by making the runners as hollow structures with a slit, like a letter box, into which sediment would be trapped into a round tube as the runners travelled over the surface. That letter–box device really should have had a Patent on it! Additionally, we often used an underwater camera to show the true nature of things way down there – but we didn't put that over the side without thinking pretty carefully about its chances of coming up again.

At each station we took a series of samples - (1) a 4-oz jar of sediment for examination of Foraminifera, minute protozoans which not only contribute to such characteristic sediments as the *Globigerina* ooze which forms a huge area of the seafloor south of New Zealand but are extremely important for geological dating and interpreting historical events; (2) a 12-oz jar of sediment to be used for mechanical analysis, the determination of grain size, sorting, and other physical characters of the sediment; (3) the various organisms collected in the trawl or dredge, then "pickled" in preservative in jars, ranging in size from 4-oz to ½ gallon, or in plastic bags or, quite often, frozen. If large chunks of rock were brought up there would be a division of spoils if they had encrusted or embedded animals. On one occasion, at least, I recall that the 12-oz sample was entirely biological because the seafloor there seemed to be entirely a pavement of nuculid shells. Sometimes, of course, the hauls were so sparse that there was not enough material even for a 4-oz jar – a great disappointment for hours of work paying out long lengths of wire and hauling it all in again often on a dark night and stormy sea – but, on the other, very often there was a embarassment of riches, buckets of lovely molluscs included!

The New Zealand Oceanographic Institute's programme of sampling the offshore bottoms of New Zealand seas began in 1955, not long after the founding of this organisation, which was set up as a branch of the DSIR largely, I believe, as a response to New Zealand's international obligations in oceanographic research resulting from discussions at the 7th Pacific Science Congress in 1947 (held in Auckland and Christchurch) – at which, as a neophyte schoolboy, I heard many world-famous figures talking on this topic. Up to then, we had been dependent on overseas expeditions doing deepwater work, right from the days of the 4-year-long, worldwide voyage of HMS *Challenger*, and a small number of local forays very few of which went into really deep water (in those days we used to think of anything over 100 fathoms as being "deep" water – never realising that in time we would be working depths as far as 5000 metres!). Dr John Yaldwyn has given a useful summary of such things then (Yaldwyn 1957), and the subsequent work of the Oceanographic Institute has been well documented in its 40th anniversary volume (Thompson 1985).

The original strategy of benthic sampling arose from an idea given to me in 1955 by Dr Joel W. Hedgpeth, then of the Scripps Institution of Oceanography, in California. He thought if we were going in "blind", so to speak, to explore a vast area of sea floor, namely the New Zealand Region (stretching from the Norfolk Island in the top left, the Kermadecs top right, and Macquarie Island bottom left to way past the Bountys and Antipodes Island bottom right), we might start off, sight unseen, by seeing what's on the continental shelf, extending round New Zealand out to about 200 metres (or 100 fathoms or so, in old terminology), by running a series of arbitrarily-positioned transects from the coast with sampling of the bottom-living animals at various depths offshore. It was a matter of seeing what was there – if we were venturing into the unknown, who knows what we would find and where it would be? The success of the Oceanographic Institute in doing just this in the fields of biology, geology, and physical oceanography, and additionally the production of sea floor charts of areas quite unknown in this respect was phenomenal over those years – as

the mass of data, publications, and expertise since inherited by NIWA can testify. I was proud to be a part of it!

Anyway, while I was overseas doing postgraduate work, a sampling programme based on Dr Hedgpeth's idea was initiated with lines of stations over the continental shelf being done at 40-mile latitudinal intervals in a series of depths (20, 40, 80, 140, and 200m), the first of such cruises being down the west coast of the South Island in 1961. The results, in time, provided the basis of an analysis of the bottom communities of the New Zealand shelf regions based on identifications of echinoderms and bivalve molluscs, these being considered the dominant and more readily distinguishable elements of the bottom fauna (McKnight 1969). In time, the survey was extended out to the slope regions[4] beyond the continental shelf, and also into the Subantarctic and South Pacific, resulting in nearly 8000 benthic stations, not all with the same gear but certainly providing some faunal and associated sediment samples at all these many positions on the sea floor of the New Zealand region (Dawson 1992: fig. 2).

Out of all this, and especially in my own deepwater sampling programmes, I used to worry, from time to time, that if we had only time at each station to take a single sample, whether it be dredge or trawl (or more happily both), and it came up with, say, a single specimen of a new or rarely-found species of deepwater mollusc, for instance, how representative was this – could we really be sure that it was "rare" or had we just got an indication that it was, at least, *present*?

This is really what this article is about, rather than my reminiscences as an early oceanographer.

We rarely had time to re-sample an area once we had carried out an oceanographic cruise in our overall programme – dependent on ship availability, financial constraints, people, and so on ... so my question or two remained unanswered.

I had read of the problem of "replicability" – whether multiple "hauls", using the same gear, taken at the same (or similar) times and/or places – or various combinations of circumstances – in short gave a true picture of the distribution in time or space, or whatever, of a particular species – all aspects of distribution, variation, variability, and associated biological (and statistical) concepts. A host of papers and texts (which I needn't list here)[5] have been written in this field, but my simple question remained: if we had sampled again (and again) – i.e. taken "replicate samples" at a particular station would we have got anything different, and to what extent? Perhaps that "rare" shell would be found to be "common". Following on from this, how many replicates would be needed to truly reveal the relative abundance of species?

There are all sorts of things resulting from such queries; and there are, equally, all sorts of ways of taking replicate samples and interpreting them, the first variable being, as I've already said – how many samples should one take to get an adequate measure of the population? This is undoubtedly much easier to plan in sampling in terrestrial or freshwater environments, and perhaps also in shallow water marine situations where there can be much more control of the sampling equipment and observation of what it is actually doing. In some marine deep-water sampling, such as with a box-corer or several kinds of grab, designed to produce quantitative samples of known volume, replicate sampling has some meaning. But in the case of deep-water bottom trawling it was always quite uncertain as to how much time the trawl was actually moving over the surface or whether it had turned over or dug in to the sediment. Since my days at sea some pretty sophisticated devices, including video camera, can now tell the operators exactly what the trawl is doing - see, for instance, remarks by Holme & MacIntyre (1971). Coloured echo-sounder traces can now reveal the configuration of the seafloor and amazingly-precise satellite position can reveal exactly where the ship is or has travelled during the period of

sampling – some fantastic advances over recent years – and a source of envy to those of us who used to feel happy on occasions without sights if we knew at the end of a day or so what our ship's position was within 50 miles!

Consideration of the number of samples needed therefore varies widely. For instance, in sampling the bottom fauna of some New Zealand lakes, Timms (1985) wanted to determine the minum number of samples required and concluded that 4 replicates were sufficient, largely based on his experience that, "typically", this number of replicates yielded more than 95% of the number of species present whereas 3 replicates yielded less than 90%. In another local project involving replicate sampling, Stark (1993) described a 'community index' for freshwater bottom-living invertebrates based on replicate sampling, finding that a series of 12 replicates appeared to capture a sufficiently high proportion of the true total number of taxa present in a stream. Other investigators have sampled with the hope that "by taking a relatively large number of consequent samples, the total sample would contain most of the species present and would thus be sufficiently large to allow valid empirical comparison of species between stations." (Gage 1972: 283). However, there are many inherent problems in trying in predict biodiversity from the contents of catches based on the reduced number of species to be expected in progessively numerically-smaller samples. This has led to long-continuing discussion on the validity and merits of the so-called 'rarefaction' methodology and the time-stability hypothesis introduced by the classic studies of Howard Sanders (1968, 1969).

Holme (1953), in his survey of the bottom fauna of the English Channel off Plymouth, faced up to the same problem of how many samples to take to give an adequate picture, and he plotted the addition of species to the sample total also, deriving a similar cumulative curve according to the number of extra hauls take. It was eventually considered that a replicate series of 5 hauls was necessary at each station (Holme & McIntyre 1971) – however, those results are not strictly applicable in the present instance since his figure was derived from more controlled sampling using a grab (which took, in theory at least, a quantitative sample of the seabed at time).

Rice & Culter (1984) developed a similar device called a "species saturation curve" which depicted the cumulative number of species encountered with the addition of each replicate sample. The result was a curve showing the relationship between the number of replicate samples carried out and the total number of species found. The curve rose more sharply with the first replicates and flattened ("asymptotically") as more replicates were added in. In this study, 15 replicates were taken, and from these results they were able to deduce a whole series of items of information about the populations which they had sampled, such as – the faunal density (= the number of organisms per surface area), the species diversity (= the number of different species found), the species richness (= the number of species in the sample related to the number of organisms) , the equitability or evenness (= the distribution of individuals between species, a sort of diversity index showing the more species and the more even their representation the more their diversity).

In a survey of deep-water molluscs in Sagami Bay, Japan, Okutani (1969) attempted a quantitative analysis of the species taken at 17 stations less than 1000 m (although he did, also, rather surprisingly, explain in some detail why it was that this sampling could not regarded as truly 'quantitative')." He found that most (84%) of the 106 species taken had been found in the first 3 hauls and that the remaining 19 species were only picked up after the 4th haul. He then devised a scale to measure the 'frequency, 'density', and 'abundance' (where it seems he designated a haul in which the species <u>was</u> found as a "positive" haul in contrast to the "total" haul – in which that species may/may not have been absent) – hence: 'Frequency' = Positive haul/total haul; 'Density' = number of specimens/total haul; 'Abundance' = number of

specimens/positive haul. He tabled the species with high frequency (> 0.24, for his 106 species), defining these as "dominant" species, although he noted that they were not always predominate in the respective catch, i.e. they are not always abundant in the trawl. He also noted, and this is directly relevant to my present study, that the quantitative reliability is low for a trawl (largely because of its unknown behaviour, for reasons that he had already itemised, at p.9). Hence, "the species which are found from many hauls regardless either richness or poorness of the catch may have a fairly large population. In other words, the species with high frequency could be more abundant than any other species which accepted the same collecting intensity as they did." In another table, Okutani listed 9 species with low frequency but which predominated over a few catches, so that they are literally "dominant" in that catch. From this he concluded:

"If a hypothesis is that every species accepted the same collecting intensity was correct, the low frequency but high abundance may represent a patchiness or deviated concentration of the species. Such distributional characteristics may be attributable to the topography of the trawling sites or specific attributes. Even if the sum of the total population of the type of species was larger than the aforementioned type of species, this could not be regarded as "dominant" in the area."(Okutani 1968: 35).

Quite a few years ago, Barnes & Bagenal (1951) reported on a statistical study of variability in catch obtained by short repeated trawls taken over an inshore fishing ground in Scottish waters. They noted: "There have only been a small number of controlled experiments on the variability of replicate sample ... an essential preliminary in a detailed ecological approach to fishery problems, for it is then necessary to know whether hauls taken at different times or in different places have given significantly different catches." The results of their particular study were rather inconclusive: a high variability was evident but the "results give no evidence on the origin of the variability in replicate hauls, that is, how much is due to inadequacies of technique and how much is inherent in the sampling variation dependent upon the population distribution." In another study, 40 years later, on the replicability of a sampler close to the seafloor, an epibenthic sledge, detailed statistical analysis was done using five different techniques, the result being that "if time and money are limited and only one haul is taken at a station, it is highly probable that one can trust the sample as representative." (Brattegard & Fosså 1991). That's very reassuring, isn't it?

Now, what I was able to do, on one occasion, was to return to one of my earlier stations (NZOI Stn D85) where we had found an abundance of interesting molluscs and echinoderms, and took time on this second occasion to run six trials using a TAM for various periods of time over what I hoped was the same area of seafloor (NZOI Stn S16), and look at the results of what we had collected each time – would a single haul have been enough to be trustworthily-representative ?

Station D85 was done on 12 May 1963 from HMNZS *Endeavour* and was situated at Latitude 49° 50.0' S and Longitude 170° 13.0'E, finishing at 49° 55.9'S to 170°15.6'E, in a depth of about 611 metres. The first haul was with the cone mesh dredge (DCMb) resulting in a rather small sample of fine white muddy ooze containing a couple of specimens of *Falsilunatia ambigua*, one of which was alive; then two hauls with medium with the 4-foot Agasssiz beam trawl (TAM), the first of which brought up a rich haul of echinoderms, molluscs and fish, a spider crab, sponges, and anemones, as a host of hermit crabs carrying their shells.[6] This was a long haul, lasting 51 minutes, and the second was even longer at 1 hour 17 minutes. There was, again, a very rich haul of starfish, urchins, and molluscs in this haul, too.

The repeat station (S16) was carried out, again from HMNZS *Endeavour*, on 14 September 1978, at 49° 50.0'S, 170° 14.0'E, in around 593 metres, and a series of 6 hauls was done.

The first haul was with a cone mesh dredge fitted with a canvas bag (DCMb) used to test the nature of the bottom. Then five hauls using a TAM were done over periods of 20, 30, 30, and 60

minutes respectively. The 6th "haul" was the lowering of an underwater camera, which took a series of 15 photographs of the seafloor over a period of 45 minutes.

NZOI STATION S16, 49° 50.0'S, 170° 14.0'E, 593 metres, 14 September 1978

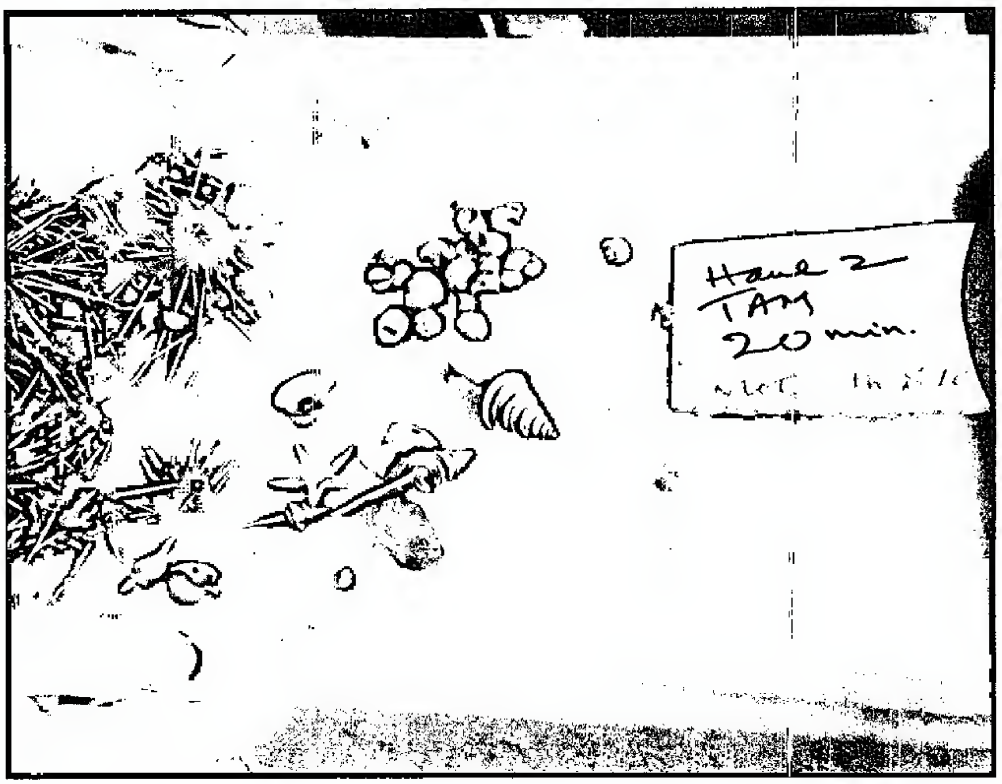


Photo: Dick Singleton

This is one of the haul from NZOI Stn S 16 – 2nd haul – a poor photograph, taken in rather hurried circumstances, but it does show something of what we got: on left, masses of the echinoids *Goniocidaris parasol* with a few entangled brittlestars (ophiuroids) and barnacles, then various molluscs including *Falsilunatia ambigua* [olim *powelli*], some odd *Euciroa galatheae* valves, *Coluzea altocanalis* inhabited by hermit crabs (i.e. "crabbed"), *Aeneator valedicta,* a couple of *Volutomitra banski*, an odd *Pectunculina tasmani*, a *Calliostoma* (*Otukaia*) *alertae* [what we used to call *Alertalex blacki* at that time], and a flatfish *Azygopus bifasciatus*.

The molluscs obtained in each haul are shown in the following table -

REPLICATE SAMPLES FROM NZOI STN S16, 49° 50'S, 170° 14.0'E to 49° 55.9'S, 170° 15.6'E, 593-585m,14 SEPTEMBER 1978

	HAUL 2 20 min				HAUL 3 30 min				HAUL 4 30 min				HAUL 5 30 min				HAUL 6 60 min			
MOLLUSCA	*n*	L	D	C	*n*	L	D	C	*n*	L	D	C	*n*	L	D	C	*n*	L	D	C
Falsilunatia ambigua	23	7	15	1	4	2	2	-	59	24	35	-	26	11	15	-	40	23	14	3
Coluzea altocanalis	2	-	-	-	7	1	-	6	26	12	7	7	24	7	8	9	87	27	25	35
Comitas onokeana vivens	2	-	2	-					7	6	1	-	2	2	-	-	14	10	3	1
Volutomitra banski	2	1	-	1					7	6	1	-	2	2	-	-	2	2	-	-
Aeneator valedictus	2	2	-	-					2	2	-	-	2	2	-	-	2	-	-	2
*Alcithoe fleming*i					2	-	2	-	17	17	-	-	11	11	-	-	29	29	-	-
Galeodea triganceae									1	-	1	-	1	1	-	-	1	1	-	-
Provocator mirabilis					1	-	1	-									1	-	1	-
Poirieria zelandica																	1	1	-	-
Calliostoma (Otukuaia) alertae																	2	2	-	-
Scaphopoda	1	-	1	-													1	-	1	-
Pectunculina lata	1	1	-	-	5	4	1	-	1	1	-	-					4	2	2	-
Eucitroa galatheae	1	1	-	-	4	2	3	-	3	1	2	-	2	1	1	-	7	4	3	-

Key: *n* = total number of specimens
L = live
D = dead (empty) shell
C = "crabbed" – i.e. occupied by hermit crabs

Taking only the molluscs collected, what do these hauls tell us?

1. Had we based our knowledge of the inhabitants of the seafloor at this particular locality based only on Haul 2 (20 minutes being the usual time for most NZOI bottom trawls), we could conclude that of the 5 kinds of gastropods (and no bivalves) found, *Falsilunatia* was pretty common whereas the others (*Coluzea*, *Comitas*, *Volutomitra*, and *Aeneator*) were uncommon if not actually rare. We wouldn't have suspected that we'd missed collecting any *Alcithoe* or *Galeodea*, let alone any elusive bivalves (but perhaps the trawl missed anything burrowing).

2. How about the results of Haul 3, then, had this been the only trawl done? *Coluzea* looks to be quite common with some *Falsilunatia*. But what happened to any other that might have been expected? And this haul was 10 minutes longer – but it did get a new one, a couple of *Alcithoe*. If *Falsilunatia* really is the commonest gastropod, how come we only got 4 ? Perhaps they cluster or aggregate – as Barnes & Bagenal (1951) thought could happen for some of their species. Again we missed any bivalves that might have been lurking in the sediment.

3. Haul 4 – another ½ -hour tow, but look at all the *Falsilunatia* and *Coluzea* (59 and 26) and a nice lot of 17 *Alcithoe*, a total of 7 kinds of gastropods this time, but again no bivavles.

4. Tried yet another ½-hour trawl – Haul 5 – results much the same, lots of *Falsilunatia* and *Coluzea*, and a total of 7 kinds of gastropods as before.

5. Now a run of 60 minutes, three times the duration of a "standard" NZOI trawl in this programme, yielded the 7 kinds of gastropods, with the same sort of relative numbers of *Falsilunatia*, *Coluzea*, a nice lot of *Alcithoe*, and an increase of *Comitas*, but still only a single *Galeodea* after all that time.

What does all this mean? Do these results satisfy my initial worry?

If you took just *Coluzea*, then we see a range in 3 hauls each of ½ -hour of numbers ranging from 7 to 26 but in double the time for a 1-hour trawl then double the number to 87. One could go on, but we don't really know what's affecting the numbers each time. It's just too simple to try to correlate numbers with duration of each trawl.

Also other questions you may well ask - what is the proportion of live and dead amongst these gastropods? How many empty shells? How many "crabbed" – with their little hermit crab inhabitants? Did the hermits seem to prefer particular gastropod homes?

If I apply the methodology of Okutani (1968) mentioned earlier – since his limitations of trawl-sampling I think are very similar to mine – these are the results:

Of the 13 taxa of molluscs collected at Station S16, 8 were taken in the 1st haul ["Haul 2" in the Table], and 6 in the 2nd (of which only 4 were taken in the 1st, with 2 others taken for the first time, and 3 taken in the 1st haul not taken again; 9 species were taken in the 3rd haul {"Haul 4" of the Table], including 3 taken in the 1st haul but not in the 2nd, with one new addition (i.e. not in 1st or 2nd hauls), and another species taken here for the first time; 8 species taken in the 4th haul, of all of which had been taken before; all 13 taxa were taken in the final, 5th haul, 2 species of which, represented by 1 and 2 specimens, had not been taken in any of the earlier trawls. Using Okutani's categories (even if he did analyse 106 taxa rather than 13 here), four groups seem distinguishable [number of specimens/positive catches following each name]:

1.*Falsilunatia* (152/5), *Coluzea* (145/5), with high 'Frequency' of 1.0, 'Abundance' 30.4 and 29.2, 'Density' 0.346 and 0.332; **2.** *Comitas* (25/4), *Volutomitra* (13/4), *Aeanator* (8/4), *Acithoe* (59/4), showing the same 'Frequency" of 0.8 but ranging in "Abundance' from 14.75 for *Alcithoe* to 2.) for *Aeneator*; **3.** *Galeodea* (3/3) and *Provocator* (2/2) with lower 'Frequency' and low 'Abundance'; and **4.** *Poirieria* (1/1), *Calliostoma* (2/1), *Pectunculina* (11/4, *Euciroa* (17/5), and scaphopods (2/2), of which the two bivalves had appreciably higher "Abundance'. [A few other single specimens, such as *Scaphander otagoensis*, were subsequently noted].

As with Okutani, it seems that species found in many or most of the trawls, whether numerous or not, may have a fairly large populations. Species with high frequencies could therefore be more abundant than any other species if the idea is sound that every species had an equal chance of being collected. Hence, low frequency but high abundance may represent patchiness of some deviated concentration (such as a food source for carnivorous gastropods perhaps) for the species or, in the case of the bivales, deeper burial. Two species, *Falsilunatia ambigua* and *Coluzea altocanalis*, stand out as 'dominant' species, but this is not necessarily a reliable indication of the size of the populations.

My figures in the preceding table hardly lend themselves to statistical analysis. Crudely-derived samples should only merit crude analysis. Well, thank goodness I'm not a statistician – nor would I want to try to be one with this information. There are, however, well-established statistical techniques that can be applied to the results of more controlled benthic sampling – even if there is still considerable dispute as which are more meaningful – see, for instance, the comments by Brattegard & Fosså (1991) – Shannon diversity index, Spearman rank correlation, G-test, Bray-Curtis similarity index, and Correspondence Analysis, and so on – as many other publications report

Perhaps it only reveals that the longer you sample the more you get – or does it ? Caution, however – the samples from which these numbers are derived cannot be called true "replicates". The circumstances in which they were taken can hardly be said to have been the same: the ship may have drifted a mile or more during the sampling period (the whole operation of Stn S16 took from 1.42 pm to 9.31 pm); the sediments on the seafloor may have changed in character (unlikely since bottom photographs show a widespread ooze floor); the trawl may have skipped over the surface in some place or become inverted at times; the runners may have dug into the substrate, bringing up animals otherwise buried well below the surface; a food source may have attracted carnivores such as the hermit crabs, resulting in an aggregation of animals in places with a paucity in others; *Pectunculina* is a pretty small shell – was the net mesh too big to catch many ? Or does it burrow too deeply? Is the elongated shape of *Coluzea* or the size of the *Alcithoe* conducive to capture by such gear? One surface-crawling *Coluzea* is visible in the photograph – are there others lurking in the sediment?

Nevertheless, the role of "rare" species has been regarded by many investigators as significant in numerical analyses of bottom-living animal associations or communities. For example, Day *et al.* (1971: 100-101) related how it has been argued by other workers that "rare species are very selective of environmental conditions and thus better indicators of homogeneous environments than are common species which tolerate a wide range of conditions." However, they postulated the counter argument "that while this may be true, the rare species are so subject to sampling errors that their distribution records do not give results as meaningful as do the records of common species." Trying to find a criterion for the terms 'rare' and 'common', they decided that since there were 10 stations in their transects only those species with a total abundance of 10 or more could possibly occur at all ten station. Applying this logic to their counts, they concluded: " What we can say with conviction is that an analysis of rare species alone does not give a reliable estimate of the distribution of the bulk of the fauna." But, as they also pointed out, they found no evidence that rare species were distributed in the same way as common species. Hence, some attempt at postulating how it is that some species are indeed 'rare' must take into account more than just sampling techniques and subsequent analysis – the ecological basis of 'rarity' needs to be established,[3] and conditions of the environment that influence this need documentation.

Sanders (1968) attempted to correlate "environmental stress" with diversity of the bottom fauna, concluding that "harsh" environments are populated by a few highly specialised species (even though those that can tolerate such conditions may be present in great numbers due to the lack of competition). If the ooze bottom south of New Zealand where the sampling reported on here was carried out can be thought of as less severe than a more varied-textured seafloor with greater fluctuating temperature and salinities and water movements, then the diversity should be expected to be greater accompanied by greater interspecific competition. Hence, our samples do have some value as environmental indicators, even if not strictly statistically amenable.

Replicate sampling is certainly simpler and more valid when done in certain better-controlled conditions such as the contrast between replicate sampling of surface plankton (Barnes & Marshall 1951) and the conditions for bottom-sampling described by Okutani (1969) and others. Other biases involved in working with the results of deep-sea dredging have been helpfully described by Sanders *et al.* (1965) as well as by Holme & McIntyre (1971 and later editions).

I'm not alone in worrying about the interpretation of such trawl results. Wolff (1961: 157) concluded that - " ... one cannot afford to draw too far-reaching conclusions from a single or a few hauls (or bottom samples) at a given locality – however rich in species and individuals they may be." He based this on a comparison between the number of species and individuals of various marine animal groups collected during the Danish Deep-sea Expedition at *Galathea* Station 716 (as detailed in his Table 1, p. 156) and the numbers obtained from a total of 11 hauls (Stns 128-129, 131-139) made by the U.S. research vessel *Vema* in the same area.. A marked difference in the abundance of the various animal groups was found, primarily due to the difference in collection gear (*Galathea*, a large herring otter trawl with meshes varying from 80 mm at the head to 14 mm at the cod end; *Vema*, small dredge, I metre opening, 3m bag with mesh down to 0.5mm). However, the detailed comparative analysis which Wolff presented only served to reveal several inconsistencies which could hardly be described to the different collecting techniques, nor could they be satisfactorily explained by the animals in question having a patchy distribution [a topic well-researched in benthic studies – see, for instance, Gage & Geekie 1973] since the contents of the 11 *Vema* hauls were remarkably uniform. Without further explanations, he felt obliged to sum up:

"The obvious disagreement in the relative number of individuals obtained by the two expeditions suggests that one should not draw too far-reaching conclusions from a single or a few hauls ..." (Wolff 1961: 160).

So, what *does* the sea floor look like at this station?

Not very exciting, hardly an animal in sight! The sediment is a soft, white calcareous ooze, being made up of the skeletons of the tiny one-celled organisms known as Foraminifera, which have dropped down through the overlying water column, over a very long period of time, to form this sediment, commonly called *Globigerina* ooze, containing over 30% calcium carbonate, and often also with the remains of pteropod molluscs. The term "Globigerina' is somewhat of a misnomer since the component Foraminifera are often dominated by other genera – hence the term "Planktonic Foraminiferal Ooze" may be preferable. This ooze[6] covers a vast area of seafloor, particularly to the southwest to east of the South Island of New Zealand in depths from about 500 metres to around 4000 metres (see coloured chart by Mitchell *et al.* 1989), at which stage the foraminiferal remains dissolve. In my experience in this geographical area, the composition of the fauna, both on the sediment and within it, is very uniform but remarkably sparse compared with shelf faunas (McKnight 1969b). This photograph of the bottom at Station S16 is a good example of this virtual desert (in surface view anyway – lots of creatures may be lurking within the sediment itself as a deep dredging might reveal). In some areas, notably on the eastern parts of the Chatham Rise (Dawson 1984), the presence of glacial erratic rocks and phosphorite nodules lying on this soft sediment provides a base for the growth of coldwater corals which can grow into quite substantial colonies acting as "oases" in a quasi-desert for the development of a rich and diverse of great ecological significance – in fact, small-scale "sea mounts" in their own way, and just as worthy of protection.

Photo: Dick Singleton

This is what the seafloor looked like at 590 metres depth at NZOI Stn S16, 14 September1978, 49° 52.2'S, 170° 15.8'E, taken from HMNZS *Endeavour*. A lonely *Coluzea altocanalis* can be seen but lots of little burrows and mounds indicate the presence other lurkers in the soft ooze. A bare "landscape" indeed!

Now, let's go back to that night on 12th May 1963 when we did station D85. If that was all we ever knew about the inhabitants of the seafloor - at that time, sampled with that gear for that dutration, we would have concluded that, although there were a lot of starfish, both in numbers and in species,[7] only a couple of live *Provocator mirabilis* and two dead were collected, giving a rather poor idea of what molluscs actually inhabited this oozey bottom - and that's what we've had to do for most of the 8000+ benthic stations done by the NZOI between 1955 and 1989 wherever no replicate samples were taken. But we DO, nevertheless, have a much better idea on what lives on the shelf and slopes around New Zealand than we did when I joined that famous establishment in February 1955!

To-day, of course, there are far more sophisticated methods of mapping and sampling the seafloor than we had 40-odd years ago – the recent NORFANZ expedition in the northern Tasman Sea, in which scientists aboard the NIWA research vessel *Tangaroa* were able to scan, and map in glorious colour, a swath of the seafloor out to 5 kilometres on each side using a multibeam system of 135 separate acoustic beams – but, more than that, the progress of bottom-sampling gear could be monitored as well (Pickrill & Barnes 2003 – see also Kostylev *et al.* 2001, and Le Gonidec *et al.* 2001) . Quite a source of envy, undoubtedly, for us "oldtimers"!

Nevertheless, the results early of our early efforts in dredging, trawling and mapping have to be recalled in the times and conditions in which they were done. That's how Science advances ...

[1] Preston (1948) defined "commonness" under four categories: "(1) The total number of living individuals of a given species, which might be called its global abundance, (2) the total number of individuals living at any instant on a given area, such as an acre or a square mile, which might be called its local abundance, (3) the ratio which the number of individuals bears to that of another species, i.e., its relative abundance, and (4) the number of individuals *observed*, for example, the number of moth species counted in a sample from a light trap, its "observed", "apparent", or "sample" abundance. Preston then went on with a detailed mathematical analysis of so-called "random" samples from trap data, constructing a Gaussian curve drawn on a logarithmic base, the results of which indicated to him that, in a word, the number of individuals collected (except for very small samples) adds more species to the total (see also "species saturation curve" concept of Rice & Culter 1984).

In another study on the nature of rarity, Vandermeer (1982) stated: "Rare species far outnumber common species. The demographic causes of rarity are thought to be first, a low carrying capacity and second, an effective community of associated predators, parasites, and/or competitors keeping the population well below its carrying capacity." But he also suggested a third possibility exits, that of "chaos." Chaos (or chaotic behaviour) in a population, he believed, necessitates "the existence of long periods of rarity followed by population flushes: the stronger the chaos, the longer the period of rarity. Such an origin of rarity is quite different from a low carrying capacity or a depression of numbers resulting from pressure from predators or competitors." He noted, however, that the recognition of such an origin of rarity could be quite difficult. Further, he concluded that – "The most dramatic difference between chaotic and nonchaotic rare populations is that under chaos the rare population could be expected to occasionally flush (i.e., rapidly grow to large numbers and then quickly crash to rarity again. Since such flushes are not expected to moccur very often, the observation that a population maintains its rare status over many years is no guarantee that it is not chaotic. Nor can one use the existence of an occasional flush as evidence for chaos." *My comment on this is – if you're sampling bottom-living animals on a research cruise – or even on an occasional visit to a beach or shore - how can a single sample or even a few more at any one period in time tell you much that's really true about the status of that "rare" specimen that you've just found?*

[1] Introducing their very fine book entitled *World Seashells of Rarity and Beauty*, Matsukuma *et al.* (1991) said: " ... some species which were once rare have become common today because collections were intensified even into remote countries as well as great depths of oceans. On the contrary, the common species in the past have sometimes become rare because of destruction of habitat by natural disasters or man's pollution." They further remarked – "Therefore, either rarity or commonness is not confined in this book which focuses to illustrate beauties and elaborations through artistic photographs ....

[1] Rabinowitz 1981, Gaston 1994, 1996, Gaston & Spicer 2004, Kunin & Gaston 1997.

[1] In 1979, I gave an account of this deeper water survey of the New Zealand region, that extending beyond the initial work over the Continental Shelf, at the XIVth Pacific Science Congress held in Khabarovsk in the Soviet Far East. The paper was eventually published in the Proceedings of the Congress, in Russian. Some of the my colleagues at that time, knowing I had done some Russian courses, thought that I was rather clever writing a whole paper in that language – but the truth is that it was translated for me by the late Dr. V.V. Bekhlemishev. However, I can't miss this opportunity to cite it again, deluding others to think me so talented!

[1] But I do, in fact, draw your attention to the following sources: Azarbayjani & Richardon 1999, Hessler & Sanders 1967, Hurlbert 1984, Magurran 1988, Morrisey *et al.* 1992, Oliver *et al.*, 1999, Pielou 1977, Sanders 1968, 1969, Underwood 1981.

[6] Other animals collected at these stations (D 85, S16) included: sea-cumbers (holothurians), starfish of the genera *Benthopecten*, *Ceramaster* [a supposed new species named after the ship's captain as *C. lennoxkingi*, sadly subsequently "sunk in synonymy" as representative of the previously described

widespread *Ceramaster patagonicus*], *Hippasterias*, *Lithosoma*, *Mediaster*, *Plutonaster*, and *Zoroaster*; sea-urchins of the genera *Araeosoma*, *Goniocidaris*, and *Phormosoma*; a new genus and species of crab, *Pteropeltarion novaezelandiae* (described by R.K. Dell in 1972); some fish, *Coelorhynchus fasciatus*, *C. oliverianus*, and *Nezeumia nigromaculata*, as well as the flatfish, *Azygopus bifasciatus*, shown in my colour photograph of S16; also sponges, hydroids, polychaete and priapulid worms, tunicates, and shrimps, other crabs and isopods including the trilobite-like *Serolis bromleyana*.

[7] See, for instance, the statistical methods used in benthic ecology as noted in Holme & McIntyre (1971 and later editions) – see also Dickman (1968), Day *et al.* (1971), Gage (1972), Christie (1976), amongst many others.

[8] An ooze is defined as a deep-sea sediment containing more than 30% of any particular biogenic component. Five major types of ooze are found in the world's deep oceans – planktonic foraminifera ooze (commonly called *Globigerina* ooze), coccolith ooze, pteropod ooze, radiolaria ooze, and diatom ooze, the first three being designated carbonate or calcareous oozes, and the latter two as silceous ooze. The former covers about 50% of the total seafloor. There is a compensation depth at which the rate of carbonate dissolution equals the rate of carbonate deposition, so that below this level carbonate sediments do not normally accumulate.

[9] The starfish *Ceramaster p. patagonicus* (originally described from this station as a new species, *C. lennoxkingi*, after the Captain of *Endeavour*, the late Cdr James Lennox-King RNZN) was represented 33 specimens; other species of starfish taken were *Hippasteria phryginana* (1), *Lithosoma novaezelandiae* (2), *Pseudarchaster garricki* (2) and *Benthopecten pikei* (1), also the sea urchins *Goniocidaris parasol* and *Phormosoma bursarium*, with the brittlestar *Ophiophthalmus suspectus*. Perhaps the paucity of molluscs is correlated with the abundance of predaceous starfish!

REFERENCES

AZARBAYJANI, F.F.; RICHARDSON, B.J. 1999: Monitoring for changes in arboreal arthropod biodiversity in woodlands: how many replicates are needed? Pp 40-45 in: Ponder, W. & Lunney, D. (eds) The other 99%. The conservation and biodiversity of invertebrates. *Transactions of the Royal Zoological Society of New South Wales*. Pp viii +1-454.

BARNES, H.: BAGENAL, T.B. 1951: A statistical study of variability in catch obtained by short repeated trawls taken over an inshore ground. *Journal of the Marine Biological Association of the United Kingdom* 29: 649-660.

BARNES, H.; MARSHALL, S.M. 1951: On the variability of replicate plankton samples and some applications of 'contagious' series to the statistical distribution of catches over restricted periods. *Journal of the Marine Biological Association of the United Kingdom* 30: 233-263.

BRATTEGARD, T.; FOSSÅ, J.H. 1991: Replicability of an epibenthic sampler. *Journal of the Marine Biological Association of the United Kingdom* 71 (1): 153-166.

CHAPMAN, P. (ed.) 1978: *The Dunmore Book of New Zealand Records*. 2nd Edition. Palmerston North: The Dunmore Press. 288p.

CHRISTIE, N.D. 1976: A numerical analysis of the distribution of a shallow sublittoral sand macrofauna along a transect at Lamberts Bay, South Africa. *Transactions of the Royal Society of South Africa* 42 (2): 149-172.

CLARK, H.E.S.; McKNIGHT, D.G. 2000: The marine fauna of New Zealand: Echinodermata: Asteroidea (Sea-stars) Order Paxillosida [by Clark & McKnight], Order Notomyotidea [by McKnight]. *NIWA Biodiversity Memoir* 116: 196p.

COD 1990: *The Concise Oxford Dictionary of Current English.* 8th Edition. Oxford: Clarendon Press. 1454p.

DANCE, S.P. 1969: *Rare Shells*. London: Faber and Faber. 128 p.

DAWSON, E.W. 1965: Oceanography and marine zoology of the New Zealand Subantarctic. *Proceedings of the New Zealand Ecological Society* 12: 44-57, figs 1-5.

DAWSON, E.W. 1982: Батиальная фауна в ограничительной экомичесой зоне нобойзеландии [The bathyal marine fauna of the New Zealand Exclusive Economic Zone] Фауна и гидробиолия шельфобых зон тихого океана [Fauna and Hydrobiology of the Shelf Zones of the Pacific Ocean] Материалы XIV тихогоокеанского научного конгресса (Хабаровск, август 1979 г. Секция «Морскаябилогиа» Вып. 4 [Proceedings of the XIV Pacific Science Congress, Khabarovsk, August 1979, Section 'Marine Biology' Issue 4].

DAWSON, E.W. 1984: The benthic fauna of the Chatham Rise: an assessment relative to possible effects of phosphorite mining. *Geologisches Jahrbuch* (D) 65 - Geology of the Chatham Rise phosphorite deposits east of New Zealand: results of a prospection cruise with R/V *Sonne* - 1981: 209-231.

DAWSON, E.W. 1992: The living Brachiopod fauna of the New Zealand Region: a systematic reference list. *Occasional Papers of the Hutton Foundation New Zealand* 2: iv + 1-60.

DAWSON, E.W. 1998: Benthic animals of Wellington Harbour. Pp 181-192 in: *Te Whanganui a Tara Wellington Harbour – Review of Scientific and Technical Studies.* Eastbourne, NZ: East Harbour Environmental Association. 200 p .

DAY, J.H.; FIELD, J.G.; MONTGOMERY, M.P. 1971: The use of numerical methods to determine the distribution of the benthic fauna across the continental shelf of North America. *Journal of Animal Ecology* 40: 93-125.

GASTON, K.J. 1994: *Rarity*. London: Chapman & Hall. 205p.

GASTON, K.J. (ed.) 1996: *Biodiversity: a biology of numbers and difference*. Oxford: Blackwells. 396p.

GASTON, K.J.; SPICER, J.I. 2004: *Biodiversity: an introduction.* 2nd Edition. Oxford: Blackwells. 191p

HESSLER, R.R.; SANDERS, H.L. 1967: Faunal diversity in the deep-sea. *Deep-Sea Research* 14: 65-78.

HOLME, N.A. 1953: The biomass of the bottom fauna of the English Channel off Plymouth. *Journal of the Marine Biological Association of the United Kingdom* 32: 1-49.

HOLME, N.A.; McINTYRE, A.D. 1971: *Methods for the Study of Marine Benthos.* [1st editon]. International Biological Programme Handbook No. 16. Oxford: Blackwells. 334 p

HURLBERT, S.H. 1984: Pseudoreplication and the design of ecological field experiments. *Ecological Monographs* 54: 187-211.

KOSTYLEV, V.E. *et al.* 2001: Benthic habitat mapping on the Scotian Shelf based on multibeam bathymetry, surficial geology and sea floor photographs. *Marine Ecology Progress Series* 219: 121-137.

KUNIN, W.E.; GASTON, K.J. (eds) 1997: *The Biology of Rarity: causes and consequences of rare-common differences*. London: Chapman & Hall. 280p.

LE GONIDEC, Y.; LAMARCHE, G.; WRIGHT, I. 2003: Using sound waves to sort out seafloor sediment types. *Water & Atmosphere* (NIWA) 11 (4): 10-12.

McKNIGHT, D.G. 1969*a*: An outline distribution of the New Zealand shelf fauna. Benthos survey, station list, and distribution of the Echinoidea. *New Zealand Department of Scientific and Industrial Research, Bulletin* 195: 1-92 (*New Zealand Oceanographic Institute Memoir* 47).

McKNIGHT, D.G. 1969*b*: Infaunal benthic communities of the New Zealand continental shelf. *New Zealand Journal of Marine and Freshwater Research* 3(5): 409-444.

McWHIRTER, N. (ed.) 1977 *Guinness Book of Records* (New Zealand Supplement). Edition 24. Enfield: Guiness Superlatives Ltd. 382p.

MAGURRAN, A.E. 1996: *Ecological Diversity and its Measurement.* 2nd Edition. London: Chapman & Hall. 179p.

MATSUKUMA, A.; OKUTANI, T.; HABE, T. 1991: *World Shells of Rarity and Beauty.* Revised and Enlarged Edition. Tokyo: National Science Museum. 206p.

MITCHELL, J.S.; CARTER, L.; McDOUGALL, J.C. 1989: New Zealand Sediments, 1:6 000,000. *New Zealand Oceanographic Institute Chart Miscellaneous Series* 67.

MORRISEY, D.J.; HOWITT, L.; UNDERWOOD, A.J.; STARK, J.S. 1992: Spatial variation in soft-sediment benthos. *Marine Ecology Progress Series* 81: 197-204.

OKUTANI, T. 1968: Systematics, ecological distribution and palaeoecological implication of archibenthal and abyssal Mollusca from Sagami Bay and adjacent areas. *Journal of the Faculty of Science, University of Tokyo* (II) XVII (1): 1-98.

OLIVER, I.; DANGERFIELD, J.M.; YORK, A. 1999: When and how to conduct a biodiversity assessment of terrestrial invertebrates. Pp 8-18 in: Ponder, W. & Lunney, D. (eds) The other 99%. The conservation and biodiversity of invertebrates. *Transactions of the Royal Zoological Society of New South Wales.* Pp viii + 1-454.

PICKRILL, R.; BARNES, P. R. 2003: Managing the seabed with multibeam mapping: learning from Canadian experience. *Water & Atmosphere* (NIWA) 11 (4): 7-9.

PIELOU, E.C. 1977: *Mathematical Ecology.* 2nd ed. New York: John Wiley. 385p.

POWELL, A.W.B. 1937/1976: *Shellfish of New Zealand/Shells of New Zealand.* 1st to 5th Editions.

PRESTON, F.W. 1948: The commonness and rarity of species. *Ecology* 29 (3): 254-283.

PRESTON, F.W. 1962: The canonical distribution of commonness and rarity: Part I. *Ecology* 43 (2): 185-215; Part II. *Ecology* 43 (3): 410-432.

RABINOWITZ, D. 1981: Seven forms of rarity. Pp 205-217 in: Synge, H. (ed.) *Biological Aspects of Plant Conservation.* Chichester: John Wiley.

RICE, S.A.; CULTER, J.K. 1984: Analysis of sampling procedures for benthic infaunal communities at an ocean dredged material disposal site. Camp Dresser & McKee, Inc. *Mote Marine Laboratory Technical Report* 87: 1-33.

SANDERS, H.L. 1968: Marine benthic diversity: a comparative study. *American Naturalist* 102: 243-282.

SANDERS, H.L. 1969: Benthic marine diversity and the stability-time hypothesis. *Brookhaven Symposium in Biology* 22: 71-81.

SANDERS, H.L.; HESSLER, R.R. ; HAMPSON, G.R. 1965: An introduction to the study of deep-sea benthic faunal assemblages along the Gay Head-Bermuda transect. *Deep-Sea Research* 12: 845-867.

STARK, J.D.1993: Performance of the Macroinvertebrate Community Index: effects of sampling method, sample replication, water depth, current velocity, and substratum on index values. *New Zealand Journal of Marine and Freshwater Research* 27: 463-478.

TIMS, B.V. 1985: An investigation of sampling strategies for lake benthos. *New Zealand Journal of Marine and Freshwater Research* 19: 71-78.

UNDERWOOD, A.J. 1981: Techniques of analysis of variance in experimental marine biology and ecology. *Annual Reviews of Oceanography and Marine Biology* 19: 513-605.

VANDERMEER, J. 1982: To be rare is to be chaotic. *Ecology* 83 (4): 1167-1168.

WOLFF, T. 1961: Animal life from a single abyssal trawling. *Galathea Report. Scientific Results of the Danish Deep-sea Expedition round the World 1950-52,* 5: 129-162.

YALDWYN, J.C. 1957: A review of deep-water biological investigation in the New Zealand areas. *New Zealand Science Review* 15 (5/6): 41-45.

Z Z Z

HOW TO COLLECT RARE SHELLS – THE EASY/CHEAP WAY?

By your Editor

Your retiring Editor has just finished his last *Cookia* – but has a ½ page to fill in. So he thought he'd put in a few lines showing his way of getting a collection of "rare" shells the easy and usually (but not always) cheap way. It's called Conchophilately - collecting shells on postage stamps (or philoconchology, I guess, if you're more interested in the shells than the finer points of collectings bits of sticky paper that might haver been by someone else). When I became fascinated by the varying portrayals of different species of shells on stamps and began to collect them as such, there were only some hundreds around; hence I thought that, in contrast to the thousands of bird stamps, I'd have a reasonable chance of getting most of them in time – but, do you know, to- day it's estimated that there are over 5000 shell stamps, produced by some 230 countries, depicting over 900 identifiable species in addition to shells appearing in borders or backgrounds. Although rare shells, as shells, may command phenomenal prices – and even some of our own deepwater ones have a great market attraction, rare shells depicted on stamps are certainly cheaper – but not all ... The first shell stamp was most likely the 1859 one penny defintive, which has a small stylised Strombus gigas in the corner – it's catalogued by Stanley Gibbons at £1500 used – a mint one could be as much as £4500 if you could get one.

There is certainly a lot of interest to be had to seeing how the various species have been depicted and how accurately they've been labelled. One of the snags I've found that is, quite often, you have to buy a whole long set of stamps of which perhaps only one depicts a shell – and then there are those, like the Bahama ones from 1859 to 1959 with the small conch in the design. The Cochin series with stylised Indian Chanks (*Turbonella pyrum*) is another example – a bit cheaper these. And the Diana/Charles Royal Wedding Series where the same design was issued by a host of Commonwealth countries. Do you try for the lot or just a representative ? It's interesting, too, to see what shells are favourites – and those that make history – for example, it wasn't until 1996 that a chiton appeared on a stamp – from New Zealand! Although *Nautilus* is quite commonly used, and some squids as well, I do still have trouble convincing stamp dealers that octopuses, which appear on over 50 stamps, are 'shells on stamps'. The best handbook you need is undoubtedly the Stanley Gibbons one *Collect Shells on Stamps* by Dr Tom Walker first published in 1995, which gives full catalogue details, prices, indexes by species and countries (NZ has 15, including 4 *Haliotis iris* and a mysterious '*Cardium* sp.' – we could do a lot better!) Another good one is Dr Kohman Arakawa's Shells on Stamps of the World (2nd ed. 1980). Tom Rice, of *Of Sea & Shore* magazine publishes lists from time to time, as do other shell magazines. Lots more to tell on this topic, if I had the space ...

NEW BOOK : CIESM Atlas of Exotic Species in the Mediterranean

By Argyro Zenetos, Serge Gofas, Giovanni Russo, José Templado.
Frédéric Briand, Editor.

Published 2003, pp. 376. CIESM, 16, bd de Suisse, MC 98000, Monaco.

The opening of the Suez Canal in 1869 brought into contact the Indo-Pacific Ocean and the Mediterranean Sea, and in the Eastern Mediterranean for decades, we have been recording the introduction of Indo-Pacific mollusk species, which is called Lessepsian Migration. We welcome this record of molluscs that have entered our domain, from the time boundary of 1920 (with a few exceptions) from the Indo-Pacific region, and also the other exotic species that arrived, after 1960 from other regions.

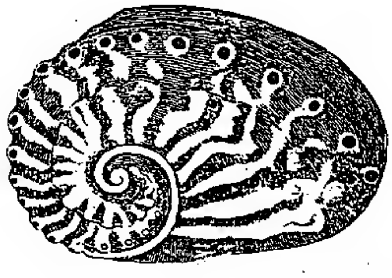
This book, published by Commission Internationale pour L'Exploration Scientifique de la Mer Méditerranée, starts with general scientific remarks, and a list of the 137 exotic species. They are well illustrated, shortly described, with mode of introduction and establishment recorded, on a double page for each species, and their distribution is shown on a map. The main key references are also recorded for each species, and where the first record was made. In conclusion there is an annotated list of the excluded species, with the rationale for exclusion, and an extensive bibliography. 85% of the species are from the Red Sea or the broader Indo-Pacific domain. The layout is exemplary, with very good graphic art, handy and easy to find the recorded species.

There may be differences of opinion about certain data mentioned, and whether additional species should have been added, but by the time any book is ready for print, new species have inevitably surfaced. We must give credit to the scientific team that spent six years accumulating the data recorded, combing the archives of reference collections of museums and institutes, and also including information from a network of experts and collectors.

Congratulations on a fine piece of study and work, from which all people interested in the Mediterranean can benefit. I am sure it will be added to all our libraries, and hope much information will be added in the future.

Zvi Orlin

Editor's note: With the current concern for the biosecurity of the marine fauna of New Zealand and the notable increase in the number of alien species being recorded, we may find some definite interest in such a reference source as this.



"An Auris Marina, or Sea Ear."
Plate II, fig. 4 in: "*Elements of Conchology: Or, an Introduction to the Knowledge of Shells, by Emanuel Mendes da Costa, Member of the Academia Caesar. Imper. Nat. Curios. Plinius IV and of the Botanic Society of Florence. With Seven Plates Containing Figures of Every Genus of Shells.* London, *Printed for Benjamin White, at Horace's Head, in Fleet-Street. MDCCLXXVI.*"

SEASHORE ECOLOGY OF NEW ZEALAND AND THE PACIFIC, BY JOHN MORTON. AUCKLAND: DAVID BATEMAN LTD. 2004. 504 p, illus.Price: $89.99.

"This is a book about the animal and plant communities set up where the margins of islands and continents slope into the sea. The primary story – to be told in greater detail – is concerned with the intertidal zone, the narrow belt over which the interface of land and sea regularly shifts back and forth ..."

I would not have the audacity to "review" such an excellent book as this surely this – rather I add my humble appreciation of the publication of what amounts to the lifework of one the most outstanding marine biologists which New Zealand has ever produced. Emeritus Professor John Morton is well-known to all who involve themselves in marine biology, whether as professionals or amateurs. Readers of the *New Zealand Listener* will also know John Morton as a distinguished theologian and environmentalist (have you delved into any of his other books such *Man, Science and God* (1972), *Margins of the Sea* (1985), illustrated by Ronald Cometti, *A Natural History of Auckland* (1993), also with striking Cometti paintings, or *Seacoast in the Seventies* (1972), each of which serves to give the measure of this multifaceted polymath?) He spent 10 years or so in England, based at Queen Mary College in East London, but worked much also at the seaside laboratory of the Marine Biological Association of the United Kingdom – the "Mecca" of international marine science, as all those who have the privilege of working there will attest.

In 1960 John Morton returned to New Zealand as the first Professor of Zoology at the University of Auckland – surely the culmination of a personal ambition. John Morton made a great name for himself, and for "malacology" as a science with his studies on form and function in molluscs, and his book *Mollusca* is still a great source of inspiration. His lesser-known book *Guts* is good stuff too, even if the title lends itself to some gentle punning by those who may not have liked it so much! He has also written books on the sea ecology of Hong Kong (1983) of Suva and southern Viti Levu in Fiji (1985), a UNESCO volume *The Shore Ecology of the Tropical Pacific* (1990) as well as a Canadian work – *Shore Life between Fundy Tides* in 1991, besides a host of molluscan papers and articles on theology.

But we all know *The New Zealand Seashore* which Professor Morton wrote in collaboration with Dr Michael Miller (himself of molluscan fame so far as nudibranchs are concerned). This book, published in 1968 with a second edition in 1973, is surely well worn in the hands of most of us, and we owe the authors such a debt for their original inspiration in putting together a marvellously illustrated and beautifully-prosed handbook to our shore fauna and flora.

What a delight, then, to see a modern successor to this pioneer volume now appear in 2004, after a generation or two of eager students have done great work inspired by "Morton & Miller"!

The new book is more than just an update of the previous editions – not only does it cover an ambitiously-wider region but has much more explanatory background on the fundamentals of the origin of the New Zealand seascape, the factors controlling distribution and survival on the shore – and a host of other new topics. You'll find pictures of many of your favourite shells, and maybe you'll learn lots you didn't know before about their habits and habitats and how they came to be where they are. And, of course, this new book has an abundance of Professor Morton's characteristic drawings of seashore profiles and habitat groupings – but, this time, many of them in glorious colour. Actually, I have a vested interest in Figure 17.12, showing seashore zonation in northern Queensland, because I was sitting on that selfsame shore in 1973 with John Morton while he sketched what lurked under the boulders and debris. I think I'm right is saying it was his first visit to a Queensland reef but, as a party of tourists walked by (we were actually close to a

well-known Barrier Reef holiday resort – and an itinerant government photographer, passing by, actually recorded this moment for posterity, as you'll see below), it didn't stop the Prof, in the manner of the Ancient Mariner, waylaying them and giving them a potted lecture on shore ecology! How little did they know what a privilege it was to be lectured to by someone so distinguished! Anyway, it was great to see the original sketch as a finished work in an illustration in the book - I enjoyed that day, and several others, so much with the 'master' of shore ecology – so it's a real pleasure to commend this wonderful offering to you all to take to your hearts and enjoy ... Don't be put off by the $89.00 price tag – it's looks a lot less than $90, the tag not the book. This new book is worth its weight in gold (actually its embarrassingly heavy to carry home, nearly 3 kg) ... at least I'll bet if you save up for it and use it as much as many of us have used our earlier editions, you'll agree with me [there's a copy of the 1968 first edition on sale for US$90 in a Christchurch bookshop and others elsewhere from US$30-$85 – so it's still a prize!).. As they say these days (so intransitively) "enjoy" ...

Let H.E. the Hon. Sandra Lee-Verco, presently High Commissioner to Niue, whom we remember as former Minister of Conservation in the Labour/Alliance Government of 1999/2002, have the last word –
"This is a resource for a wide audience in Aotearoa and beyond: it makes available to and useable by us what is known about the fascinating zone that surrounds every island in our Pacific region. It also illustrates what we stand to preserve by the establishment of marine reserves in representative and unique areas along our coast lines."

She concludes, as I would also - "Enjoy reading and using this taonga – treasure it."

Photo: News and Information Bureau, Department of the Interior, Canberra, 1973.

BOOK REVIEW: THE SHELLED MAGALLENIC MOLLUSCA: WITH SPECIAL REFERENCE TO BIOGEOGRAPHIC RELATIONS IN THE SOUTHERN OCEAN By Katrin Linse, 2002, 252p, with Supplementary Appendix

My interest in the Southern Ocean has been fostered by my shell collections from South Africa, Australia, New Zealand and recently acquired species of the southern West Atlantic, mainly from Uruguay and Argentine. This book has opened up new vistas and information on many new species.

It opens with a short summary in English and German. The material on which the book is based was collected on 5 expeditions, mainly to the Straits of Magellan, Beagle Channel, Campo Hjelo Sur and the Weddell Sea. Station lists, sampling gear and handling on board are recorded, also Phylogeny and Taxonomy methods. The Biogeography section shows the faunal relations and shared species, in number and percentage, of the Magellan Region to neighbouring areas in South America, Antarctica and selected locations in the Southern Ocean. The chapter on Survey Areas recalls historic surveys, the Geology, Topography, Hydrography, Paleogeology and Paleoclimatology of the Magellan and Antarctic regions, marking the borders of the Magellan region that also includes the Falkland Islands. The section on Results contains preliminary Identification Keys for 285 Magellanic mollusca. In some taxa, where a division at species level is difficult, the key stops at genus level. This is followed by a Systematic Report and detailed description of 42 species of shelled gastropods, and 10 species of bivalves, including 8 new species, one new genus and the generic change of two species. They include information on the source of the Type material, and previous distribution records, with comparative remarks, and distribution maps, showing the location of finds of the species.

The last section designated Discussion, mentions 397 benthic molluscan species. described by the author. Polyplacophora are excluded owing to it being revised at the time of publication. Two characteristics of the region are noted: a large number of globally distributed families, and a large number of bipolar genera. After an extensive bibliographic list, the Glossary includes shell and radula morphology, and technical terms. In conclusion, 162 black and white plates illustrate the shell and radula morphology of selected Magellanic and Antarctic species described in the text. Regrettably, as no index is included in the book, seeking information on specific taxa is both difficult and time consuming. The Appendix consists of a Species List comprising over a thousand taxa of shelled Gastropoda, Scaphopoda and Bivalvia, and a Biogeographic Database. These lists have to be ordered by E-mail or Fax. This is a most unusual procedure, and it is not clear why they were not included in the book, as they are an integral part of it, and of great value and major importance; regrettably endemic species are not designated in this list.

To sum up, this study based on Research Vessel expeditions, and a review of some of the literature published, will no doubt help to focus attention on one of the most remote and stormy regions of our planet. We must salute Dr. Katrin Linse, and all her colleagues of the British Antarctic Survey, and the crews of the vessels who participated in the recorded expeditions, for their excellent efforts under extremely adverse and dangerous climatic conditions, in recording and making available this most significant knowledge to both conchologists and malacologists. Hopefully, more information will be forthcoming, and a list of endemic species published, to make us aware of the region's contribution to Biodiversity on Earth.

Zvi Orlin

WELLINGTON SHELL CLUB
2004

President: Jenny Raven
Vice-Presidents: Doreen Burr, Selwyn Bracegirdle
Secretary: Deirdre Standish ['phone: 938-6554; mailto: *deirdre.standish@clear.net.nz*]
Treasurer: appointment pending ...
Editor: appointment pending ...
Newsletter: Jill Burnet [84 Brougham Street, Mt Victoria, Wellington; 'phone: 384-7418]
Librarian: Deirdre Standish
Sales table & raffles: Kris Woods
Website: John Little [*http://users.actrix.co.nz/littlejn*]

Membership fees [for 2004] -
Single $10; Family $12; Overseas: $20

Subscriptions to – The Secretary, pending appointment of new Treasurer

Contributions for *Cookia* to – The Secretary, pending appointment of new editor.
[These positions will be filled, on a temporary basis at least, after the AGM 25th November 2004]

Please use (unless there is a stated reason not to do so given in your manuscript) the molluscan names in the latest 'Checklist of the Recent Mollusca described from the New Zealand Exclusive Economic Zone' by H.G. Spencer, R.C. Willan, B.A. Marshall, and T.J. Murray – which is periodically updated at

http://toroa.otago.ac.nz/pubs/spencer/Molluscs/index.html

Authors should also save the editor work by checking the spelling of these names very carefully. Following standard practice, in long lists of species the species names should not be listed in alphabetical order but in systematic sequence (with Family headings) as in the 'Checklist'. Bruce Marshall, our "resident malacologist", is very willing to check identifications or species names for any members who would like his help. Please take advantage of this generous offer. The Editor is always very happy to discuss proposed contributions with members, especially regarding the use of tables and photographs.

NOTE: This electronic checklist is a compilation of information that has already been published; it does not contain any original name changes or new records. Therefore, it can be regarded as a "tool of convenience" giving the latest names and where to find the publications in which any new changes will have appeared. New name changes are regularly given in a section entitled "*Recent Changes to the Web Page*" with a reference to the publication in which the change was made. The Mollusca Section library at the Museum of New Zealand Te Papa Tongarewa contains an unsurpassed collection of the world literature on Mollusca, and the original sources of any name changes can be easily be consulted, by arrangement with Bruce Marshall, if needed. This list is linked to our website, but members without access to the internet can obtain hard copies of whatever sections of the 'Checklist' they need by arrangement with Pat Lakeman, 'phone 479-2919 or *pat.lakeman@transit.govt.nz*

WELLINGTON SHELL CLUB
PUBLICATIONS

COOKIA is the journal of the Wellington Shell Club and is published annually, containing articles and smaller items of interest on shells, shell collecting, and molluscs as well as other related marine topics Members and other readers are invited to submit contributions (handwritten, typed, or electronic, equally acceptable) but, preferably, these should be in the Editor's hand before the end of May for inclusion in that year's issue (look at a recent issue to see the style to follow).

Cookia was first published in 1976; prior to this the Club published a *Circular*, then a *Bulletin*, as well as occasional *Study Notes* on various families of Mollusca.

PUBLICATIONS TO DATE:

1956-1965 *Circular* 1 to 21
1967-1975 *Bulletin* 1 to 36
1976-1977 *Cookia* Volume 1, Nos 1, 2, 3
1977-1978 *Cookia* Volume 2, Nos 1, 2, 3
1979-1980 *Cookia* Volume 3, Nos 1, 2, 3
1980-1981 *Cookia* Volume 4, Nos 1, 2, 3
1982-1984 *Cookia* Volume 5, Nos 1, 2, 3, 4
1985-1992 *Cookia* Volume 6, Nos 1, 2, 3, 4
1993-1996 *Cookia* Volume 7, Nos 1, 2, 3, 4 [Index]
1997 *Cookia* Volume 8
1998 *Cookia* Volume 9
1999 *Cookia* Volume 10
2000 *Cookia* Volume 11
2001 *Cookia* Volume 12
2002 *Cookia* Volume 13
2003 *Cookia* Volume 14 ['The Shell Lists']
2003 *Cookia* Volume 15
2004 *Cookia* Volume 16

(*Cookia* Volume 7, No. 4, is an index of all articles in the Club's publications to 1996)

BACK NUMBERS

Back numbers of *Cookia* are available at cost plus postage; individual articles, and copies of the Bulletins, Circulars and Study Notes can be ordered at 10c per page plus postage, from *Jill Burnet, 84 Brougham Street, Mt Victoria, Wellington, New Zealand*; or see our homepage at www.actrix.gen.nz/users/littlejn